KEMRO

KeTop T100
User's Manual V4.00

Translation of the original instructions

KEBA®
Automation by innovation.

Document : V4.00 / article no.: 57463
Filename : t100_bhen.pdf
Pages : 144

© KEBA 2009
Specifications are subject to change due to further technical developments. Details presented may be subject to correction.

All rights reserved.

A: KEBA AG, Gewerbepark Urfahr, A-4041 Linz, Tel.: +43 732 7090-0, Fax: +43 732 7309-10, E-Mail: keba@keba.com

D: KEBA GmbH Automation, Leonard-Weiss-Straße 40, D-73037 Göppingen, Tel.: +49 7161 9741-0, Fax: +49 7161 9741-40, E-Mail: keba@keba.com

US: KEBA Corp., 100 West Big Beaver Road, Troy, MI 48084, US, Tel.: +1 248 526-0561, Fax: +1 248 526-0562, E-Mail: usa@keba.com

CN: Beijing Austrian KEBA Science and Technology Development Ltd., Room B516, Nan Xin Cang Tower, A22 Dong Si Shi Tiao, Dong Cheng District, Beijing, 100027, P.R. China, Tel. +86 10 6409-6592, Fax +86 10 6409-6312, E-Mail: china@keba.com

www.keba.com

Record of Revision

Version	Date	Change in chapter	Description	changed by
V3.20	07-2009	all	Insert or adapt requirements (2006/42/EC, EN ISO 13849-1, ZT 05)	lb
V4.00	08-2009	all	Release	lb, kreu, mahr

© KEBA 2009

Table of Contents

1 Introduction 9
1.1 Purpose of the document 9
1.2 Target groups, pre-conditions 9
1.3 Intended Use of the Handheld Terminal 9
1.4 Notes on this document 10
1.4.1 Contents of document 10
1.4.2 Not contained in this document 11
1.5 Documentation for further reading 11
1.6 Definition of terms 11
1.7 Information about MD 2006/42/EC 11
1.7.1 Which devices have to comply with the new machine directive? 12
1.7.2 Quantitative safety relevant specifications for emergency stop-button and enabling control device 12
1.7.3 Relationship between Performance Level and Safety Integrity Level 12
1.7.4 Abbreviations 13
2 Safety notes 14
2.1 Representation 14
2.2 2.2 General safety instructions 14
2.3 Personnel safety instructions 16
3 General product description 18
3.1 Construction 19
3.2 Ergonomic Features 20
3.3 Housing 20
3.4 Operating and Display Panel 20
3.5 Hardware 20
3.6 Type Plate 21
4 Connection 22
4.1 Cable Entrance Area 22
4.1.1 Adhesive label for CPU serial number and Ethernet (MAC)-address 22
4.2 Cable Routing in Cable Entrance Area 22
4.2.1 Cable outlet RS-422-A 24
4.2.2 Cable outlet Ethernet 24
4.3 Power Supply 24
4.4 Emergency Stop Button and grey Stop Button 25
4.5 Enabling Switch 26
4.5.1 Functioning 27
4.5.2 Example of Connection with PILZ PNOZ s6.1 Control Relay 29
4.6 Foreseeable Misuse of Enabling Switch 30
4.7 Ethernet 31
4.7.1 Wiring diagram 32
4.8 RS-422-A 32

© KEBA 2009

4.8.1 Wiring diagram ... 33
4.8.2 General information about the RS-422-A interface ... 33
4.9 Serial port female connector S2 for Debug Interface (RS-232-C) ... 33
4.10 PC Card Slot for PC Cards I, II, III ... 34
4.10.1 Inserting the PC Card ... 35
4.10.2 Removing the PC Card ... 36

5 Membrane Keypad ... 37

5.1 General Membrane Keypad ... 37
5.1.1 7.7“ display (640x480 pixels) ... 38
5.1.2 8.4“ display (800x600 pixels) ... 39
5.2 Robotics Membrane Keypad ... 39
5.2.1 7.7“ display (640x480 pixels) ... 40
5.2.2 8.4“ display (800x600 pixels) ... 41
5.3 Numbering of LEDs ... 41

6 Display ... 43

6.1 Touch Screen ... 43

7 Software ... 44

7.1 Windows CE ... 44
7.2 Generation of Program for Windows CE ... 45
7.3 KeTop API Design ... 45
7.3.1 Common data types ... 45
7.3.2 Handling of Errors ... 46
7.4 Functions ... 46
7.4.1 Functions for starting and closing ... 46
7.4.2 Functions for Configuration ... 47
7.4.3 Functions for Reading the Configuration ... 48
7.4.4 Peripheral Functions ... 49
7.4.5 LED Functions ... 51
7.4.6 Other functions ... 52
7.4.7 Functions for Subscribing Events ... 53
7.5 Update API Design ... 58
7.5.1 Handling of Errors ... 58
7.6 Initialising ... 58
7.6.1 Functions ... 59
7.7 Program for Starting the Application and KeTop API ... 62
7.7.1 Functional description ... 62
7.7.2 Registry entries ... 62
7.7.3 Example ... 63
7.8 RDP - Connection via Remote Desktop Protocol ... 64
7.8.1 RDP-Server (Remote-PC) ... 65
7.8.2 RDP-Client (PC) ... 65
7.8.3 RDP-Client (KeTop) ... 65
7.9 KVC - KEBA Virtual Channel ... 70
7.9.1 Events of Server ... 71
7.9.2 Data Transmission ... 71
7.9.3 Example: Interface on Server ... 73
7.10 Remote Software ActiveSync ... 78
7.10.1 Data connection via RS-232-C debug interface ... 78
7.10.2 Data connection via USB client ... 79

KEBA © KEBA 2009

8 KeTop - Specific Operating Instructions 80
8.1 Setting of Date and Time 80
8.2 KeTop Configuration Tool (ConfigTool) 81
8.2.1 Calibration of Joystick 81
8.2.2 Calibration of Potentiometer 82
8.2.3 Display and Touch Screen Settings 82
8.2.4 Setting the Handwheel to Zero 83
8.2.5 Actions on next Startup 83
8.2.6 Control of Buttons (Pushbuttons) 84
8.2.7 Loading an Image File 85
8.2.8 Version Info 86
8.2.9 Checking the Operating and Control Elements 86
8.3 Installation of Programs 87
8.4 Saving Files 87
8.5 Transfering Files 87
8.5.1 Transfer via external storage device (PC-card, CF-card, USB-Stick) 87
8.5.2 Transfer via network connection by SMB acces from PC to KeTop 87
8.5.3 Transfer via network connection by access from KeTop to the PC 88
8.5.4 Transfer via ActiveSync 88

9 Options 89
9.1 Override Potentiometer 89
9.2 Electronic Handwheel 89
9.3 Illuminated Push-Button 89
9.4 Key Switch 89
9.5 Selector Switch 90
9.6 Joystick 90

10 Accessories 91
10.1 Wall Bracket without Height Adjustment plate KeTop WB090, WB095, WB120 91
10.1.1 10.1.1 Dimensions (mm) 92
10.2 Wall Bracket with Height Adjustment plate KeTop WB 110 93
10.2.1 Height adjustment plate 93
10.3 Junction Box JB 001 94
10.3.1 Device description 95
10.3.2 Connection 96
10.3.3 Connection diagram 96
10.3.4 Shielding inside the Control Cabinet 100
10.3.5 Mounting Instructions 101
10.3.6 Technical data of Junction Box JB 001 102
10.4 KeTop CB211 Connection Box 102
10.4.1 Construction 103
10.4.2 Interior view 104
10.4.3 Technical data of the connection terminals 104
10.4.4 Drilling template for wall mounting 106
10.4.5 DIN Rail Holder Mounting Set KeTop DR200 107
10.4.6 Use of Connection Box 108
10.4.7 Minimum Bending Radius of Cable 108
10.4.8 Technical Data of Connection Box KeTop CB211 108
10.5 Connection Cable KeTop TTxxx 109

© KEBA 2009

10.6 Intermediate Cable KeTop IC2xx ... 111
10.7 Download Cable KeTop XD040 ... 112

11 Transport Conditions ... 114

12 12 Disposal of the KeTop ... 115

13 Technische Daten ... 116

13.1 Allgemein ... 116
13.2 Environmental conditions ... 116
13.3 Housing ... 116
13.4 Processor and interfaces ... 117
13.5 E-Stop ratings ... 117
13.6 Enabling device ... 118
13.7 Accessories ... 118
13.8 Spare parts ... 119

14 CE Conformity, Directives and Standards ... 120

14.1 European Union Directives ... 120
14.2 Machinery Safety ... 120
14.2.1 "Hazard and Risk Analysis" ... 121
14.2.2 "Principles for the Integration of Safety" ... 121
14.2.3 "Technical Construction File" ... 122
14.2.4 "State of the Art" ... 123
14.2.5 "Recognition of Conformity by means of Harmonised Standards" ... 123
14.2.6 Selection of Performance Level and Safety Categories in accordance with EN ISO 13849-1 ... 123
14.2.7 Application of Handheld Terminals in Special Operating Modes ... 124
14.2.8 Information about the Emergency Stop Button ... 125
14.2.9 Application of Emergency Stop Button and Stop Button on the Handheld Terminal ... 126
14.2.10 Information about Enabling Devices ... 128
14.3 Electromagnetic Compatibility ... 130
14.3.1 The electromagnetic environment – interference sources, interference sinks and coupling paths ... 130
14.3.2 EMC measures ... 133
14.3.3 EMC measures on KeTop ... 137
14.4 List of the appropriate EC directives and applied standards ... 141
14.4.1 EC directives ... 141
14.4.2 Standards ... 141

15 Conformity and Type Examination ... 143

15.1 EC Conformity Declaration ... 143
15.2 EC Type-Examination Certificate ... 144

KEBA © KEBA 2009

1 Introduction

1.1 Purpose of the document

This document describes the hand-held terminal KeTop T100.

This document contains all specifications required by machinery directive 2006/42/EC.

1.2 Target groups, pre-conditions

This document is intended for the following persons with corresponding pre-conditions:

Target group	Prerequisite knowledge and ability
Project engineer	Technical basic education (advanced technical education, engineering degree or corresponding professional experience), Knowledge about: ● the method of operation of a PLC, ● safety regulations, ● the application.
Start-up technician	Technical basic education (advanced technical education, engineering degree or corresponding professional experience), Knowledge about: ● safety regulations, ● the method of operation of the machine or system, ● fundamental functions of the application, ● system analysis and troubleshooting, ● the setting options at the operating devices.
Service technician	Technical basic education (advanced technical education, engineering degree or corresponding professional experience), Knowledge about: ● the method of operation of a PLC, ● safety regulations, ● the method of operation of the machine or system, ● diagnosis possibilities, ● systematic error analysis and troubleshooting

1.3 Intended Use of the Handheld Terminal

The intended use of the Handheld Terminal covers tasks like watching and parametrizing up to operating of machines e.g.:

- Injection moulding machine
- Robots

© KEBA 2009

- Machine tools
- Textile machines
- Printing machines
- Theater backdrops
- and similar

in normal operating modes

- Automatic

as well as

- Setting
- Teaching
- Testing
- and similar

in half automatic or manual mode.

Enabling switches and an emergency stop button (or halt-button) are the safety elements of the device.

The Handheld Terminal is intended for fixed connection to a robot. Handheld Terminals for temporary connection must not have a red-yellow emergency stop button. In this case a handheld terminal with grey halt-button is available.

To meet the safety category 3 PL d in accordance with EN ISO 13849-1, the safety functions are realized with 2 circuits.

The selection of the Handheld Terminal which is suitable for the machine and the projecting of the additional functions must obey the necessary hazard analyses and risk assessment bounded by law.

For intended use of the Handheld Terminal also please pay attention to *chapter 14 "CE Conformity, Directives and Standards" on page 120*.

1.4 Notes on this document

This manual is integral part of the product. It is to be retained over the entire life cycle of the product and should be forwarded to any subsequent owners or users of the product.

1.4.1 Contents of document

- Safety Precautions
- General Instructions
- Connection
- Membran Keypad
- Display
- Software
- Specific Operating Instructions

KEBA © KEBA 2009

- Options
- Accessories
- Transport Conditions
- Disposal
- Technical Data
- CE Conformity, Directives and Standards

1.4.2 Not contained in this document

- Mask description of the application

1.5 Documentation for further reading

Doc.No.	Description	Target group
-	-	-

1.6 Definition of terms

This user's manual corresponds to machinery directive 2006/42/EC. The terms used in this manual that come from the machinery directive are the same as in the preceding MD 98/37/EC.

Within standard EN 60204-1 the following term has changed:

EN 60204-1:1997	EN 60204-1:2006
Enabling device	Enabling control device (chapter 10.9)

In order to avoid ambiguity for users this manual still uses the term of EN 60204-1:1997.

1.7 Information about MD 2006/42/EC

The machine directive (MD) 2006/42/EC will be valid from 2009-12-29 (without any transition period). This means that all machines and safety components that will be brought to market after this date have to confirm this new MD and its harmonised standards.

For handheld terminals from KEBA this means that besides the new machine directive also the standard EN ISO 13849-1:2008 will be used.
EN ISO 13849-1 demands for the safety relevant component "enabling switch" the specification of category and Performance Level (PL) and for emergency stop-buttons and grey stop-buttons the specification of the B_{10d}-value.

These values can be found within the manuals in *chapter 13.5 "E-Stop ratings" on page 117* and *chapter 13.6 "Enabling device" on page 118*.

© KEBA 2009

1.7.1 Which devices have to comply with the new machine directive?

This rule is valid for KEBA and its customers:

Depending on the date the product has been put into circulation the new machine directive has to be applied or not. If the KeTop will be delivered in its end use after 2009-12-29, it will be put into circulation newly - even if it has been sold by KEBA at an earlier date.

- Devices complying with the old MD and that will be sent to KEBA for repair, **can** be repaired and delivered in compliance with the old MD.
- Customer sends old device for repair and will receive the same or another, equal device.
- Devices complying with the new MD and that will be sent to KEBA for repair, **must** be repaired and delivered in compliance with the new MD.

1.7.2 Quantitative safety relevant specifications for emergency stop-button and enabling control device

- **Emergency stop-button:**

  KEBA specifies a B_{10d}-value. Other values (e.g. SIL, PL, Category) **cannot** be specified by KEBA.

  Explanation: KEBA solely delivers the control element, but no evaluation of the element. The customer has to connect the emergency stop to his application on his own. Depending on the connection of the emergency stop to the machine the SIL- or category and PL-value can be determined.

- **Enabling control device:**

  KEBA specifies category and PL in accordance to EN ISO 13849-1. Derived from this value KEBA also specifies a PFH- and $MTTF_d$-value in accordance to EN ISO 13849-1. SIL (in accordance to EN 62061 or EN 61508) cannot be specified by KEBA.

  Explanation: The enabling control devices has been evaluated in accordance to EN ISO 13849-1. A B_{10d}-value is not available for the enabling control device, as this device consists of the mechanic element and the electronic evaluation. This means that KEBA specifies $MTTF_d$- and DC-values (and derived from these values also Category, PL and PFH) for the enabling control device as a whole (starting from the pushbutton up to the clamps within the junction box).

1.7.3 Relationship between Performance Level and Safety Integrity Level

When evaluating safety functions by IEC EN 62601 the PL can be transformed into SIL by following the equivalence table of EN ISO 13849-1.

Table 4 (EN ISO 13849-1) - Relationship between Performance Level (PL) and Safety Integrity Level (SIL)

Performance Level (PL) by EN ISO 13849-1	Safety Integrity Level (SIL) by IEC 61508-1
a	no corresponding value

KEBA © KEBA 2009

b	1
c	1
d	2
e	3

Table 3 (EN ISO 13849-1) - Performance Level (PL)

Performance Level (PL)	Average probability of a dangerous breakdown per hour 1/h
a	≥ 10^{-5} to < 10^{-4}
b	≥ 3 x 10^{-6} to < 10^{-5}
c	≥ 10^{-6} to < 3 x 10^{-6}
d	≥ 10^{-7} to < 10^{-6}
e	≥ 10^{-8} to < 10^{-7}

1.7.4 Abbreviations

Abbreviation	Term
B_{10d}	-
$MTTF_d$	Mean Time to Dangerous Failure
DC	Diagnostic Coverage
PL	Performance Level
PFH	Probability of Failure per Hour
SIL	Safety Integrity Level

© KEBA 2009

2 Safety notes

2.1 Representation

At various points in this manual you will see notes and precautionary warnings regarding possible hazards. The symbols used have the following meaning:

DANGER!

- **indicates an imminently hazardous situation which will result in death or serious bodily injury if the corresponding precautions are not taken.**

WARNING!

- **indicates a potentially hazardous situation which can result in death or serious bodily injury if the corresponding precautions are not taken.**

CAUTION!

- **means that if the corresponding safety measures are not taken, a potentially hazardous situation can occur that may result in property injury or slight bodily injury.**

CAUTION

- **CAUTION used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in damage to property.**

- **This symbol reminds you of the possible consequences of touching electrostatically sensitive components.**

Information

Useful practical tips and information
on the use of equipment are identified by the “Information” symbol. They do not contain any information that warns about potentially dangerous or harmful functions.

2.2 2.2 General safety instructions

The device was developed, manufactured, tested and documented in ac-cordance with the applicable safety standards. If you follow the instructions regarding safety and use as described in this manual (see *chapter 1.3 "Intended Use of the Handheld Terminal" on page 9*), the product will, in the normal case, neither cause personal injury nor damage to machinery and equipment.

The instructions contained in this manual must be precisely followed in all circumstances. Failure to do so could result in the creation of potential sources of danger or the disabling of safety features integrated in the handheld terminal.

KEBA © KEBA 2009

Apart from the safety instructions given in this manual, the safety precautions and accident prevention measures appropriate to the situation in question must also be observed.

Handling of KeTop

You have chosen a high-quality KeTop that is equipped with highly sensitive state-of-the-art electronics. To avoid malfunctions or damage through improper handling, follow these instructions during operation.

WARNING!

The following application areas are expressly excluded for the KeTop:

- **Use in areas prone to explosion or fire**
- **Use in mining**
- **Outdoor use**

Other products must be used for these applications!

The KeTop housing must not be opened (acception: cable entrance area) , as the KeTop is sensitive to electrostatic discharge.

© KEBA 2009

CAUTION

- **Turn off the power supply before opening the cable entrance area of the KeTop. Otherwise the components could be destroyed or undefined signals could occur.**
- **Make sure that nobody can fall over the cable to avoid that the device falls to ground.**
- **Take care not to squeeze and thus damage the cable with any object.**
- **Do not lay the cable over sharp edges to avoid damaging the cable sheath.**
- **If you do not use the device, hang it into the wall bracket KeTop WBxxx provided for storage.**
- **Do not lay down the device with the operating side facing down to avoid damaging the operating elements.**
- **Never lay the device onto unstable surfaces. It could fall to ground and thus be damaged.**
- **Never lay the device close to heat sources or into direct sunlight.**
- **Avoid exposing the device to mechanical vibrations, excessive dust, humidity or to strong magnetic fields.**
- **Never clean the device, operating panel and operating elements with solvents, scouring agent or scrubbing sponges. For cleaning the device, use a soft cloth and a bit of water or a mild cleaning agent.**
- **Make sure that no foreign objects or liquids can penetrate into the device. Check at regular intervals the protective covers of the device, if all housing screws are firmly tightened and if the housing or the cable entry is damaged.**
- **If the device shows any defect, please send it, including a detailed error description, to your supplier or the relevant after-sales service office.**
- **If the KeTop is equipped with a touch screen, then operate the touch screen with fingers or use a touch-pen. Never use sharp objects (e.g. screwdriver,...) for operating the touch screen. This could damage the touch screen.**

2.3 Personnel safety instructions

WARNING!

Danger to persons by electric shock!

- **Only supply the device with power from voltage sources having protective extra-low voltage (e.g. SELV or PELV acc. to IEC 61131-2)**
- **Only connect voltages and circuits which are safely separated from dangerous voltages (e.g. by means of sufficient insulation) to connections, terminals or interfaces up to a rated voltage of 50 V.**

CAUTION!

Danger of fire in case of component failure!

- **In final application, make sure the 24 V DC power supply to the operator panel is adequately fused! Max. permissible fuse is 3.15 A!**

KEBA © KEBA 2009

WARNING!

- **For the right projecting of the Handheld Terminal the manufactorer must enforce a hazard and risk analysis. The following safety aspects must be considered:**

  - Right cable length for limitation of workspace.

  - Is an emergency stop button necessary and permissible?

  - Is the safety category for the application sufficient?
- **From the operating place the operator must have a good view at the hazard area.**
- **The device may be operated in faultless condition only and the operating instructions must be observed.**
- **The operator must have a sufficient educational level and must know details of intended use described in the user's manual.**
- **The safety advices in the following chapters must be considered absolutely.**
- **Further informations to safety and EMC are included in chapt. "CE Conformity, Directives and Standards". They must be considered absolutely.**

© KEBA 2009

3 General product description

The handheld terminal KeTop is a portable operating and display device with rugged design and Windows-CE compatible electronics. Using a high-performance processor and providing a serial interface and Ethernet, the KeTop is ideal for a great variety of applications.

All tasks can be solved graphically and in color, and operation is intuitive using a touch screen.

Instead of rotating mass memories such as floppy disk and hard disk drives that are not suitable for rough environmental conditions, the KeTop uses scalable FLASH and RAM banks.

The KeTop provides a Windows CE platform for applications generated with common visualization tools or with C#, Visual Basic.NET or Visual C++. Moreover, the KeTop can be connected as a client to a Win NT, Win 2000 or Windows XP server.

Through the use of optional operating and control elements, the KeTop can easily be adapted to the specific application.

Weiters ist es auch möglich, das KeTop als Client an einen Windows NT-, Windows 2000-, oder Windows XP-Server anzubinden.

KEBA © KEBA 2009

3.1 Construction

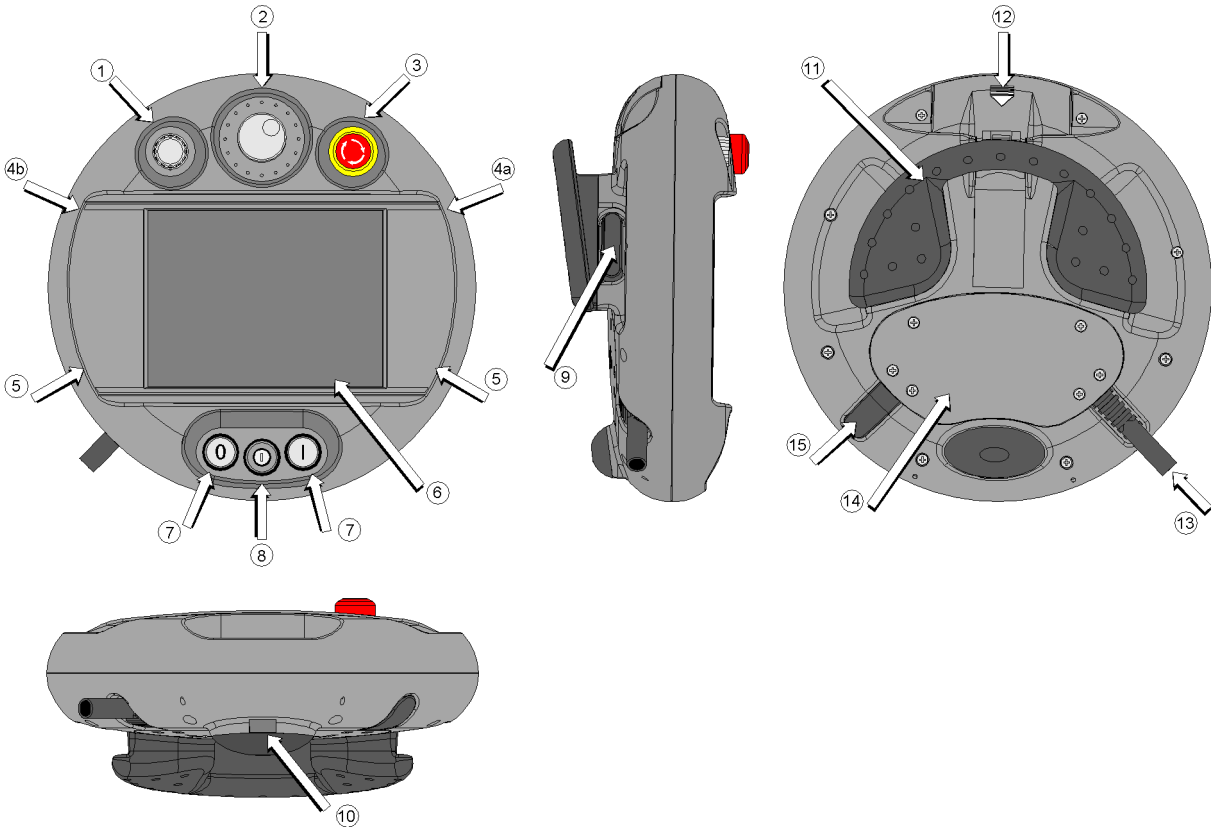


Fig.3-1: Construction of KeTop T100

1 ... override potentiometer (option)	2 ... electronic handwheel or joystick (option)
3 ... emergency stop switch (twin circuit) or stop switch (option)	4a... 2 status LEDs (standard)
4b... further status LEDs (option)	5 ... membrane keypad with tactile feedback
6 ... color STN LC display with touch screen: 7,7“ VGA resolution (640 x 480) or 8,4“ SVGA resolution (800 x 600, option)	7 ... 2 locations for (option): illuminated push-button (momentary 0), illumniated push-button (momentary I), illuminated push-button (maintaining I/0)
8 ... 1 location for (option): illuminated push-button (momentary 0), illumniated push-button (momentary I), illuminated push-button (maintaining I/0), 3-position key switch (I-0-II), 3-position selector switch (I-0-II)	9 ... two 3-position enabling switches (left and right), twin circuit
10... multigrip handle	11... PC card cover
12... strain relief for connection cable (delivered with the cable)	13... cable entrance area (lid)
14... blind plug for cable outlet not used (to meet protection degree IP54)	

© KEBA 2009

Information

All optional operating elements are described in chapter 9 "Options" on page 89 .

3.2 Ergonomic Features

- Multigrip handle
- Round housing
- Different holding positions
- Operation by right-handed and left-handed people
- Desk top operation
- Operation in wall bracket
- The cable outlet can be on the left or right side of the housing.
- Easy-to-read display

3.3 Housing

- Vibration- and shock resistance
- Housing made of non-flammable material (UL 94-V0), impact-resistant, withstands water, cleaning agents (alcohol and tensides), oil, drilling oils, grease and lubricants
- Twin shell, extremely sturdy housing. Drop-tested on industrial flooring from a height of 0.75 m (29.5 in, SVGA) and 1 m (39.4 in, VGA).

3.4 Operating and Display Panel

- Membrane keys with tactile feedback
- 2 status LEDs
- Buzzer in upper part of housing
- Resistive touch screen, to be operated with finger or stylus
- Backlit color STN LC display: 7.7“ VGA (640x480 pixels) or 8.4“ SVGA (800x600 pixels)

3.5 Hardware

- CPU Intel StrongARM SA-1110/206 MHz
- Memory:
  - DRAM: max. 128 MB, FLASH: max. 64 MB
- Interfaces:
  - Ethernet

KEBA © KEBA 2009

- Serial interface: RS-422-A, RS-232-C (debug interface in device)
- PC card slot, with dust protection cover to guarantee IP54 when the device is closed: For connection of various PC card components, type I-III (DRAM, SRAM, network cards, etc.).

3.6 Type Plate

Sample of a KEBA type plate of the KeTop product family:

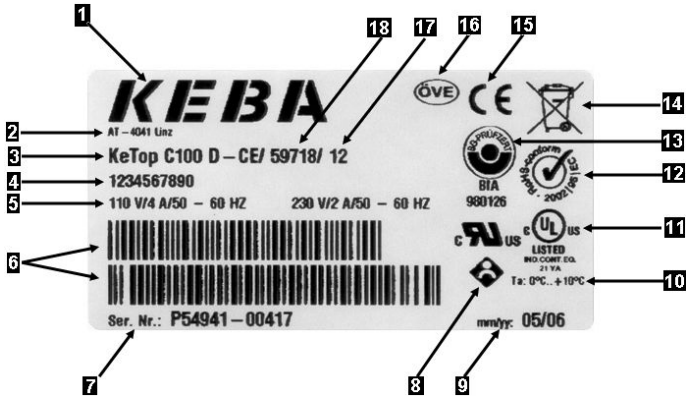


Fig.3-2: Sample type plate of the KeTop product family

1 ... Manufacturer	2 ... Manufacturer's address
3 ... Material name	4 ... Further information (optional)
5 ... Technical data (here: power supply)	6 ... Bar code
7 ... Serial number	8 ... SIBE marking (optional)
9 ... Date of production (month/year)	10... Ambient temperature
11... UL marking (optional)	12... ROHS marking
13... BG marking (optional)	14... Advice for electronic scrap regulation
15... CE marking	16... ÖVE marking (optional)
17... Revision number of device	18... Material number

© KEBA 2009

4 Connection

4.1 Cable Entrance Area

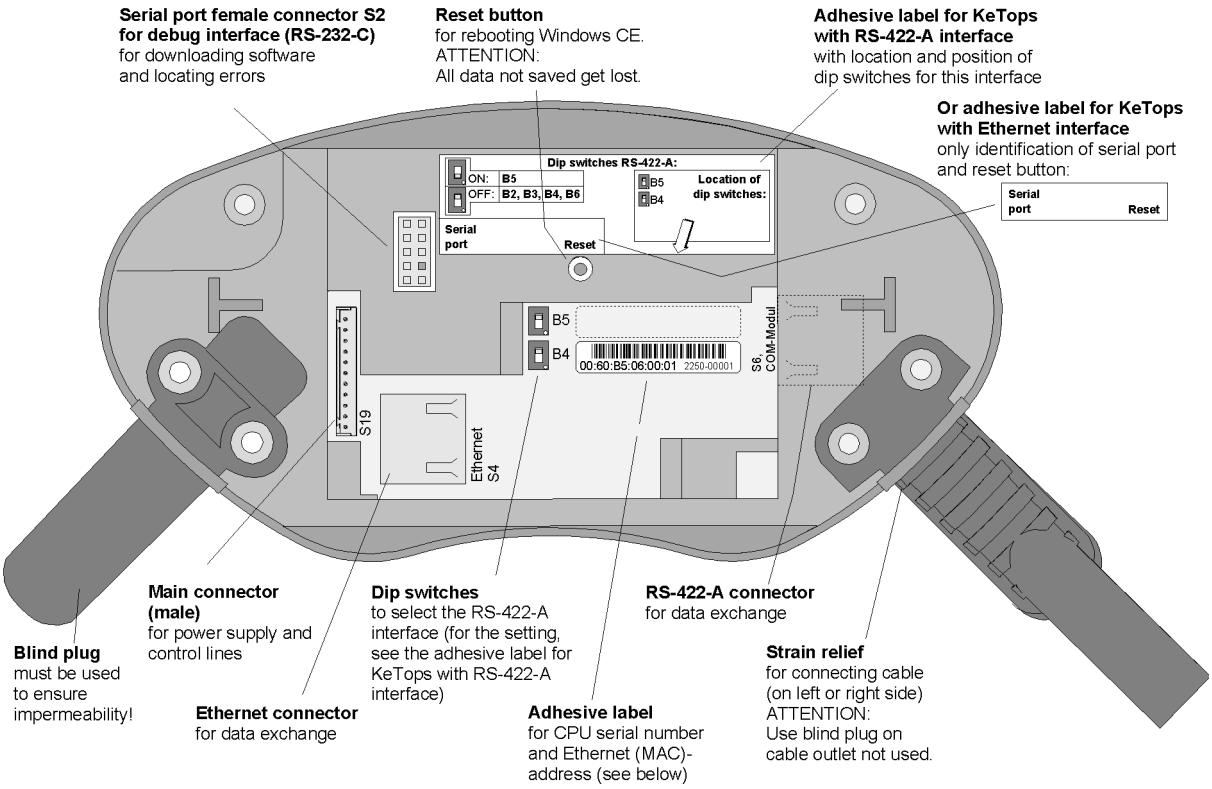

Serial port female connector S2 for debug interface (RS-232-C) for downloading software and locating errors
Reset button for rebooting Windows CE. ATTENTION: All data not saved get lost.
Adhesive label for KeTops with RS-422-A interface with location and position of dip switches for this interface
Or adhesive label for KeTops with Ethernet interface only identification of serial port and reset button:
Dip switches RS-422-A:
ON: B5
OFF: B2, B3, B4, B6
Location of dip switches:
Serial port
Reset
B5
B4
00:60:B5:06:00:01 2250-00001
S6, COM-Modul
S19
Ethernet S4
Blind plug must be used to ensure impermeability!
Main connector (male) for power supply and control lines
Ethernet connector for data exchange
Dip switches to select the RS-422-A interface (for the setting, see the adhesive label for KeTops with RS-422-A interface)
Adhesive label for CPU serial number and Ethernet (MAC)-address (see below)
RS-422-A connector for data exchange
Strain relief for connecting cable (on left or right side) ATTENTION: Use blind plug on cable outlet not used.

Fig.4-1: Cable entrance area of KeTop T100

4.1.1 Adhesive label for CPU serial number and Ethernet (MAC)-address

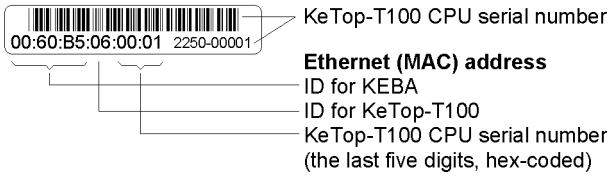


Fig.4-2: Adhesive label for CPU serial number and Ethernet-address

4.2 Cable Routing in Cable Entrance Area

After opening the cable entrance area, the connecting lines can be routed as described in the following chapters. Before opening the KeTop please pay attention to the following safety instructions:

KEBA © KEBA 2009

Information

Instructions for opening the cable entrance area:

- *Lay the KeTop with the display facing down onto a plane and clean table (preferable on ESD pad) and take care not to damage the KeTop and its operating elements.*
- *For opening and closing the cable entrance area use the following type of screwdriver: "Phillips size 2".*

Instructions for modifications in the cable entrance area:

- *Unplug the main connector (S19) by pulling on its wires with your fingers. Do not use any sharp objects.*
- *For unplugging the RJ-45 jack (S4 oder S6), actuate the locking lever:*

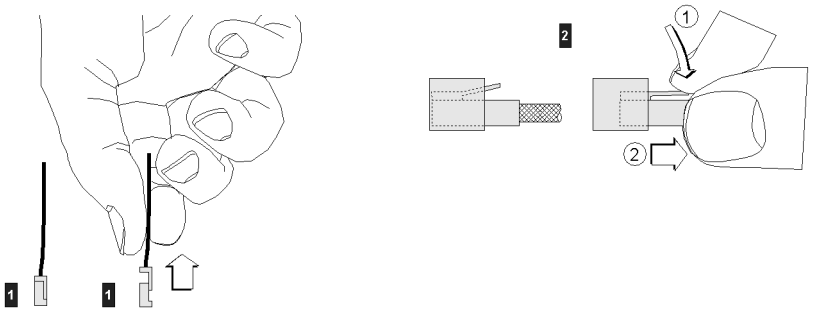


Fig.4-3: Uplugging main connector (S19) and RJ-45 jack (S4 oder S6)

1 ... main connector
2 ... RJ-45 jack

WARNING!

- **Make shure that the main connectors (S19) and the RJ-45 jack (S4 oder S6) correctly snap in when you plug them in. Otherwise the emergency stop functionality (S19) or the correct shielding (S4 oder S6) might not be given any more.**
- **Validate the emergency stop-functionality before re-starting the KeTop.**

Information

Instructions for closing the cable entrance area: Make sure that

- *the sealing is clean, not damaged and correctly positioned in the cable entrance area,*
- *no cables are squeezed in,*
- *the cover of the cable entrance area is attached again with all 6 screws (torque: 0.4 bis 0.5 Nm). Otherwise the protection degree cannot be guaranteed.*

© KEBA 2009

Information

The position of connectors S11 (RS-422-A) and S4 (Ethernet) in KeTop T50VGA is just the other way round like in KeTop T100. Users of both devices please take care for this!

4.2.1 Cable outlet RS-422-A

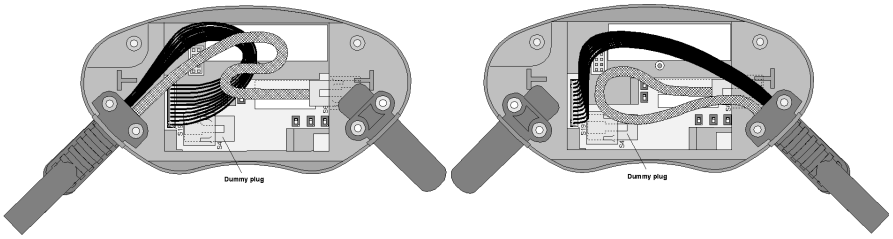


Fig.4-4: Cable outlet on left and right side if the RS-422-A interface is used.

4.2.2 Cable outlet Ethernet

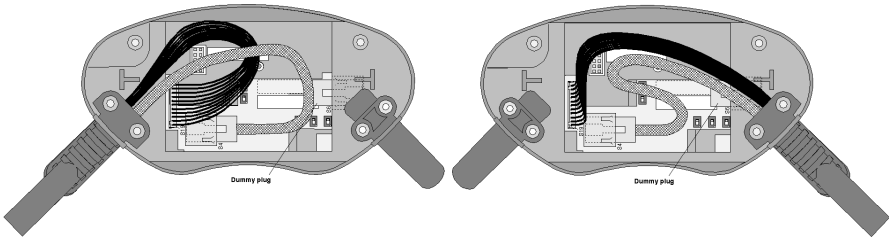


Fig.4-5: Cable outlet on left and right side if the Ethernet interface is used.

4.3 Power Supply

WARNING!

The device meets the safety class III in accordance with EN61131-2. The 24V power supply for the equipment must be guaranteed through safe isolation of the low-voltage circuits from dangerous-contact voltage circuits (e.g. by safety transformers or similar facilities).

WARNING!

A safe isolation between safety extra-low voltage and voltage that is dangerous for human contact has to be assured.

WARNING!

The power supply circuit must be protected with a 3.15 A fuse.

Specification of power supply lines in the KeTop TTxxx connection cable:

KEBA © KEBA 2009

- Cross section: AWG24 (0.24mm²)
- Material: zinc-coated copper strand
- Line resistance: ≤ 90 Ohm/km (≤ 145 Ohm/mile)

The nominal supply voltage directly on the handheld terminal (without KeTop TTxxx connection cable) is: +24 V DC (fully operational in the range 18 V DC - 32 V DC).

Maximum interruption time of supply voltage: ≤ 10 ms (according to IEC 61131)

Power consumption: 7.2 W (400 mA at 18 V DC, 300 mA at 24 V DC)

4.4 Emergency Stop Button and grey Stop Button

The emergency stop button respectively the grey stop button used on the KeTop features two circuits. The contacts are normally closed.

The red-yellow emergency stop button of the handheld terminal meets the requirements of the EN ISO 13850. It must be designed as an emergency stop of category 0 or category 1 (see EN 60204-1 chapter 9.2.5.4.2) on the basis of the risk assessment for the machine. The connection of the positive-break contacts to an appropriate monitoring system must meet the safety category (in accordance with EN ISO 13849-1) which is defined by means of the risk assessment (in accordance with EN ISO 14121-1) of the machine.

Optionally the KeTop is also available with a grey stop button instead of the red-yellow emergency stop button. In principal the grey stop button has the same functionality as the red-yellow emergency stop button. If the handheld terminal is not plugged in, the grey color of the stop button should avoid the usage of the non-effective (emergency) stop button in dangerous situations.

The grey stop button fulfils also all mechanical aspects of the EN ISO 13850 and differs from the emergency stop button only by its color.

© KEBA 2009

WARNING!

- **Not fully functional emergency stop devices may have fatal consequences! Emergency stop switches which are red-yellow marked must be effective under all circumstances in all operating modes of a machine or plant.**

  Store handheld terminals with not operational red-yellow emergency stop switches on a place where the operator cannot see it, so that he can not mistake the device.

  Handheld terminals which are plugged in and out frequently for temporarely use, must not have a red-yellow emergency stop switch. Such devices must be equipped with a grey stop switch.
- **Resetting an activated emergency stop facility must not result in uncontrolled start-up of machines or installations.**
- **The emergency stop button does not replace other safety facilities.**
- **The emergency stop button on the handheld terminal does not replace the emergency stop buttones to be mounted directly on the machine.**
- **Some mechanical errors in emergency stop switches can be recognized at operation only.**

  Test the function of the emergency stop switch when the device had been exposed to mechanical shock (e.g. it had been fallen on the ground).

  Additionally the emergency stop switch must be tested cyclic (6 monthly). Watch the machine stopping after the emergency stop switch had been pushed.
- **For further informations to emergency stop switch observe *chapter 14 "CE Conformity, Directives and Standards" on page 120*.**

4.5 Enabling Switch

The KeTop is equipped with two enabling switches, one at the left and one at the right side of the device. This allows a left- and right-hand operation of the enabling switch. Both enabling switches are equivalent and parallel switched. So for enabling only one of both enabling switches must be activated.

The enabling switch consists of a 3-position operating element and an separated evaluation electronics. An essential feature are the continuous two-channel circuits beginning from the actuating elements up to the connecting terminals. For the evaluation circuits different technologies and circuits are used. Due to the electronic switching contacts, their lifetime does not depend on the load provided the nominal values of the load (ohmic, inductive and capacitive) are not exceeded.

The switching elements of the enabling switches are protected against reversed polarity. The outputs of both circuits are protected against short circuits and overload.

Circuit 1: thermal protective circuit

Circuit 2: fold back line

KEBA © KEBA 2009

4.5.1 Functioning

The actuating element consists of two symmetrically arranged slides. The position of these slides is detected by electrical switches and transmitted to the evaluation electronics.

Positions of enabling switch:

Position	Function	Enabling switch	Contacts
1	home position	is not pressed	enabling outputs are open
2	enabling	is pressed	enabling outputs are closed
3	panic	is pressed strong	enabling outputs are open

Tab.4-6: Positions of the enabling switch

WARNING!

The enabling switch must be tested cyclic (6 monthly) by pressing the panic position. Watch the machine performing the panic function after pressing the enabling switch.

4.5.1.1 Enabling

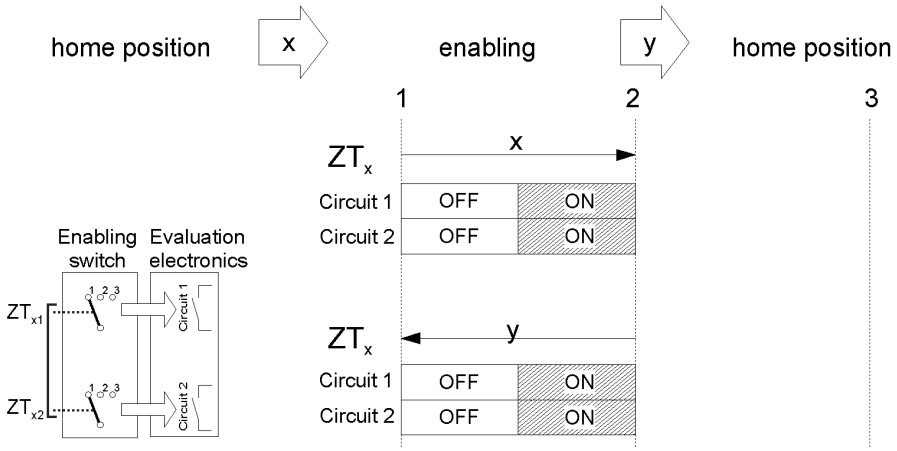


Fig.4-7: Contact travel diagram for enabling

4.5.1.2 Panic

The pushing of the actuating elements into the panic position is evaluated in a way that the enabling position is skipped when the actuating elements are released.

© KEBA 2009

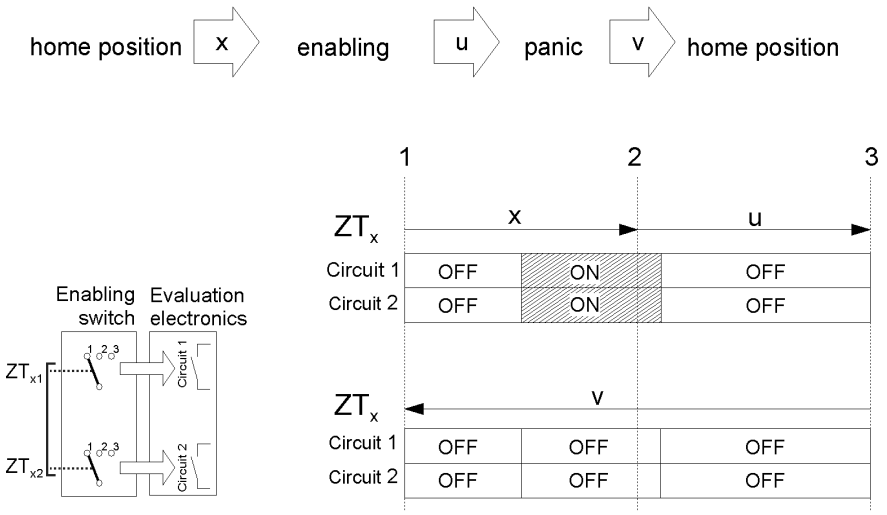


Fig.4-8: Contact travel diagram for panic

Information

At the KeTop, the enabling switches always feature two circuits.

To meet the safety category 3 PL d in accordance with EN ISO 13849-1, the enabling switch must be realized with 2 circuits and these circuits have to be monitored on short circuits.

The safety category 3 PL d means, that one failure must not lead to the loss of the safety function, and whenever possible, the single failure is detected.

The example of connection in *chapter 4.5.2 "Example of Connection with PILZ PNOZ s6.1 Control Relay" on page 29* shows how the safety category 3 PL d can be fulfilled by the enabling switch up to the output terminal K4 within the connection box. The entire concept of the machine must be laid out according to the principles of safety category 3 PL d.

The monitoring of the simultaneity by the control relay is necessary, because otherwise maybe a failure culmination would not be recognised and this would cause the loss of safeness:

Example:

If one circuit of the enabling device switches to the enabled state as a result of a failure and after some time the second circuit also switches to the enabled state as a result of an failure, then no de-energisation by the enabling device would be possible.

Further the EN 60204-1 prescribes that the enabling switches shall be connected to a category 0 stop or a category 1 stop, that means the energy must be switched off.

For calculation of the PL for the safety function "enabling" the PL- and B_{10d}-values of all involved components have to be included. For details for calculating the PL for the whole safety function see EN ISO 13849-1, chapter 6.3, appendix H and appendix I.

KEBA © KEBA 2009

4.5.2 Example of Connection with PILZ PNOZ s6.1 Control Relay

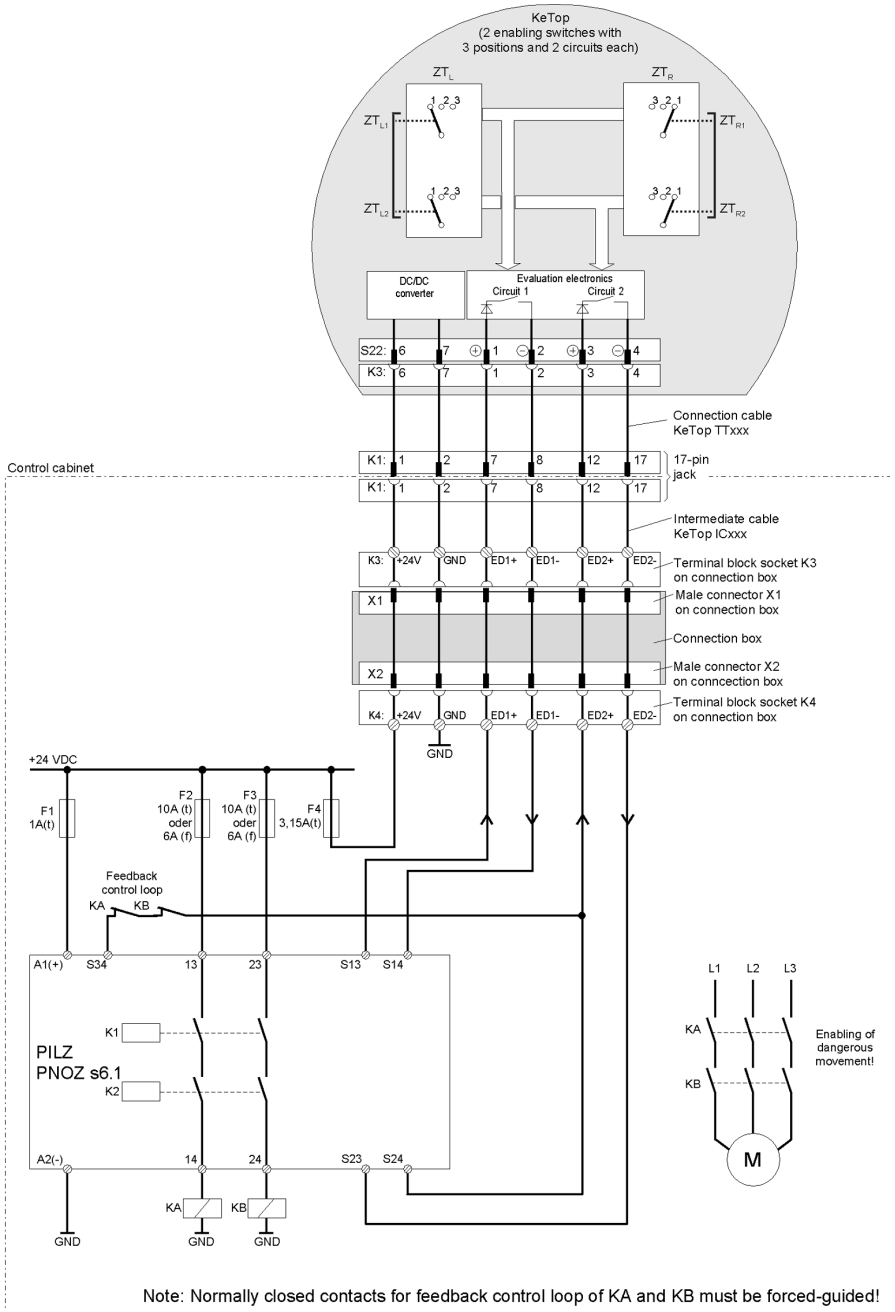


Fig.4-9: Suggested wiring of enabling swithches to fulfill safety category 3 PL d for the enabling switch with PILZ control relay. Also follow the instructions described in the PILZ operating manual about the device PNOZ s6.1. For calculation of the whole safety function "enabling" the control relay and all subsequent components have to be considered.

4.5.2.1 Functional procedure

- Only if both channels are activated "simultaneously (≤0,5s)" (by pressing one of the enabling switches) both output relays K1 and K2 will energize and the output contacts 13-14 and 23-24 will close.
- The output relays K1 and K2 will not energize if
  - only one enabling channel is activated (in case of a defect),

© KEBA 2009

- the tolerance value for the simultaneity period is exceeded,
- the feedback control loop S34 is open.

- If one enabling channel is deactivated after being simultaneously activated (by releasing the enabling switch or in case of a defect), the output relays K1 and K2 will return to their initial position again. The forced-guided output contacts 13-14 and 23-24 will open. The output relays will energize again only after both enabling channels have been deactivated and simultaneously activated once again.

In this way the enabling switches avoid that one single error makes the safety function inoperational. A single error will be recognized at the next cycle at the latest, identifying that re-enabling is no longer possible. In case of short circuit the control relay switches to ERROR and has to be turned OFF and ON again after resolving the error.

4.6 Foreseeable Misuse of Enabling Switch

Foreseeable misuse means the not allowed fixing of the enabling switch in the enabling position. The foreseeable misuse of the enabling switch must be restricted. The following measures causing the stop of the machine in the manual mode are recommended:

- Inquiry of the enabling switch when turning on the machine/plant and inquiry of the enabling switch when changing the operating mode from automatic to manual (The enabling switch must not be in the enabling position.).
- The enabling switch must be released within a defined period and pushed into the enabling position again. The length of the period must be defined according to the activity.

WARNING!

- **The enabling switch is only suitable as safety function if the operator activating the enabling switch recognizes the dangerous situation in time so that he can immediately take the necessary measures to avoid such situations. As additional measure reduced speed of the movement can be necessary. The allowed speed must be determined by means of a risk assessment.**
- **The enabling switch is only used to enable commands for performing dangerous movements. The commands themselves must be activated by a separate operating element (key on handheld terminal).**
- **Only the person who operates the enabling switch is allowed to work in the dangerous area.**
- **For further informations regarding the enabling switch please pay attention to *chapter 14 "CE Conformity, Directives and Standards" on page 120*.**

KEBA © KEBA 2009

4.7 Ethernet

The standard version of the KeTop is equipped with an Ethernet interface. This interface is based on the 10BaseT specification and suitable for the half-duplex mode (the operation with 100Mbit requires a special connection cable).

The data communication for these interfaces takes place via the Ethernet connector S4 (marking: ETHERNET) in the cable entrance area of the KeTop.

The following interface parameters are defined and cannot be changed:

- 10 MBit (100MBit with appropriate cable possible)
- TCP/IP protocol

The Ethernet interface is selected under Windows CE as follows:

Start ▸ ***Settings*** ▸ ***Control Panel*** ▸ ***Network and Dial-up Connections***: Here you can select the Ethernet on-board interface SMSC911x11.

WARNING!

If the KeTop and the control do not communicate via a point-to-point connection, it may happen that the keypad data, for example, are transmitted with a delay.

Therefore it is advisable to establish the connection between the control and the KeTop only via an Ethernet switch which enables a point-to-point connection.

The positions of the Dip switches in the cable entrance area are not relevant for this interface.

If an Ethernet PC card is inserted into the PC card slot, the internal Ethernet interface must be deactivated.

The selection between the internal Ethernet or the PC card Ethernet interface is made in the „ConfigTool“. See chapter*chapter 8.2 "KeTop Configuration Tool (ConfigTool)" on page 81*.

© KEBA 2009

4.7.1 Wiring diagram

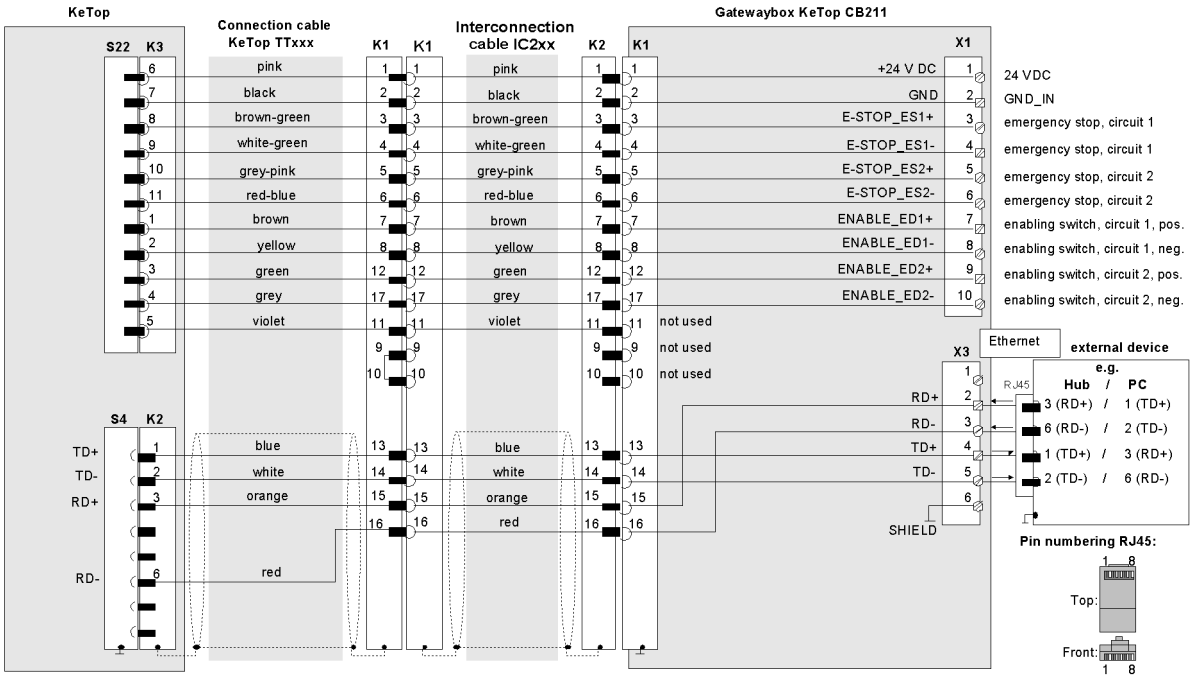


Fig.4-10: KeTop T100 with Ethernet via connection box KeTop CB211

4.8 RS-422-A

The serial interface will operate asRS-422-A. The communication takes place via the COM/SIO connector S11 in the cable entrance area of the KeTop.

Information

The simultaneous use of the Ethernet interface and the RS-422-A interface is not possible.

The RS-422-A interface assigned to the COM 5 interface port is in the software. The interface parameters are set via the WIN32API in the Windows operating system.

KEBA © KEBA 2009

4.8.1 Wiring diagram

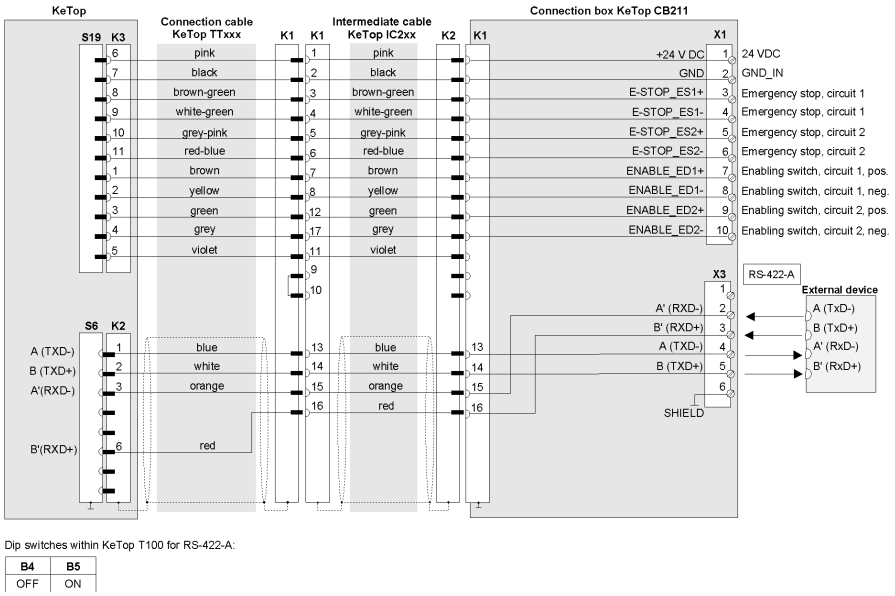


Fig.4-11: Connection of KeTop T100 with RS-422-A via connection box KeTop CB211

4.8.2 General information about the RS-422-A interface

- The A terminal of the generator shall be negative with respect to the B terminal for a binary 1 (MARK or OFF) state.
- The A terminal of the generator shall be positive with respect to the B terminal for a binary 0 (SPACE or ON) state.

To identify the lines, the voltage between the lines A and B can be measured by means of a voltameter.

4.9 Serial port female connector S2 for Debug Interface (RS-232-C)

Using the "Boot-Loader" software, the "serial port" interface can be used for debugging and for downloading software. Using the remote software Active-Sync, it can be used for adjusting and transmitting data from and to a PC. For that purpose, the download cable KeTop XD040 is available.

The following interface parameters are defined and cannot be changed:

- 115200 baud
- 8 data bits
- 1 stop bit
- no parity
- no handshake

The debug interface is assigned to the COM 1 interface port in the software.

The positions of the Dip switches in the cable entrance area are not relevant for this interface.

© KEBA 2009

4.10 PC Card Slot for PC Cards I, II, III

The following list gives an overview about the tested PC cards and their manufactors. These PC cards are recommended for the use in the KeTop.

ATA flash cards:

- Manufacturer: Kingston, SanDisk, Kingmax, Viking

  Type: all PC cards type II

  Memory sizes: 8 MB and more

PC card adapter for CompactFlash (CF) cards:

- Manufacturer: Hama

  Type: PC card adapter CF type II, Hama art. no. 56949
- Manufacturer: Kingston

  Type: CF/ADP Compact Flash PC card Adapter
- Manufacturer: Ultron

  Type: UPA-150 PCMCIA adapter for compact flash card

Ethernet cards:

- Manufacturer: Socket (http://www.socketcom.com)

  Name: LP-E Ethernet Card

  Type: PC cards type II

  Transmission rate: 10 Mbit/s

  Special features: NE2000 compatible
- Manufacturer: Orinoco (http://www.wavelan.com)

  Name: WaveLan Silber IEEE 802.11

  Transmission rate: 11 Mbit/s

  Special features: Wireless LAN card

Modem cards:

- Manufacturer: TDK (http://www.tdksys.com/Products/5660.html)

  Name: Global Freedom 5660

  Type: PC cards type II

Information

- *The KeTop does not support CardBus cards.*
- *PC cards which use 12 V programming voltage are not supported by the KeTop.*
- *SRAM cards are not supported by Windows CE.*

KEBA © KEBA 2009

4.10.1 Inserting the PC Card

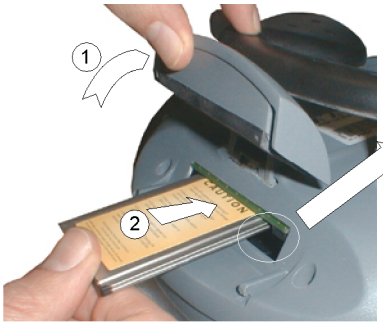
1

KeTop mit dem Display nach unten auf einem planen, sauberen Untergrund auflegen, sodass das KeTop oder dessen Bedienelemente nicht beschädigt werden (zB.: ESD-Matte)

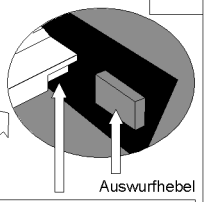
2

Verriegelung der PC-Card-Klappe wie abgebildet entriegeln (es muss dabei der Druckpunkt überwunden werden).

3



1) Öffnen der Klappe
2) Einsetzen der PC-Card wie dargestellt



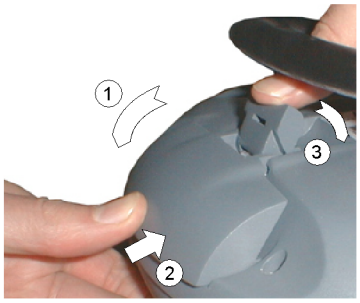
ACHTUNG:
Beim Einsetzen darauf achten, dass der Anschlag der PC-Card auf der Seite des Auswurfhebels in den Aufnahmeschacht eingeführt wird.

4

ACHTUNG:
Überprüfen Sie vor dem Schließen der PC-Card-Klappe den ordnungsgemäßen Zustand und den korrekten Sitz der Dichtung.

PC-Card soweit in den Schacht einführen bis die Verriegelung einrastet und der Entriegelungsknopf ausgefahren ist.

5



1) Schließen der Klappe
2) und 3) Verriegeln der Klappe wie dargestellt

6

Verriegelung einrasten!

Verriegelung der Klappe ganz nach unten drücken, bis sie fühlbar einrastet. Nur dann ist die Schutzart IP54 wieder gewährleistet.

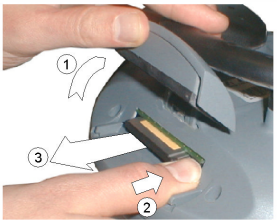
© KEBA 2009

4.10.2 Removing the PC Card

1

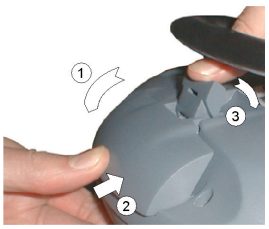
Unlock the PC card cover as shown
(until the locking lever is released).

2



1) Open the PC card cover.
2) Press the ejection button of the PC card slot.
3) Remove the PC card.

3



1) Close the cover.
2) and 3) Lock the cover as shown.

4

Press down the cover until it snaps in completely to meet the protection degree IP54.

KEBA © KEBA 2009

5 Membrane Keypad

5.1 General Membrane Keypad

The **keypad assignment** is stored in the registry and defined for the general membrane keypad as follows:

Key Labelling	Windows Virtual Key Code	Hex	Dec
ESC	VK_ESCAPE	0x1B	27
Menu	VK_MENU	0x12	18
Numpad figures 0-9	VK_0-9	0x30 - 0x39	48 - 57
Dot (.)	VK_PERIOD	0xBE	190
Minus (-)	VK_OEM_MINUS	0xBD	189
Enter	VK_RETURN	0x0D	13
Backspace	VK_BACK	0x08	8
Tabulator	VK_TAB	0x09	9
Page Down	VK_NEXT	0x22	34
Page Up	VK_PRIOR	0x21	33
Cursor Up	VK_UP	0x26	38
Cursor Left	VK_LEFT	0x25	37
Cursor Right	VK_RIGHT	0x27	39
Cursor Down	VK_DOWN	0x28	40
Illuminated push-button, left	VK_F13	0x7C	124
Key switch/selector switch, left	VK_F14	0x7D	125
Key switch/selector switch, right	VK_F15	0x7E	126
Illuminated push-button, right	VK_F16	0x7F	127

Depending on the size of the display, two general membrane keypads are available:

© KEBA 2009

5.1.1 7.7“ display (640x480 pixels)

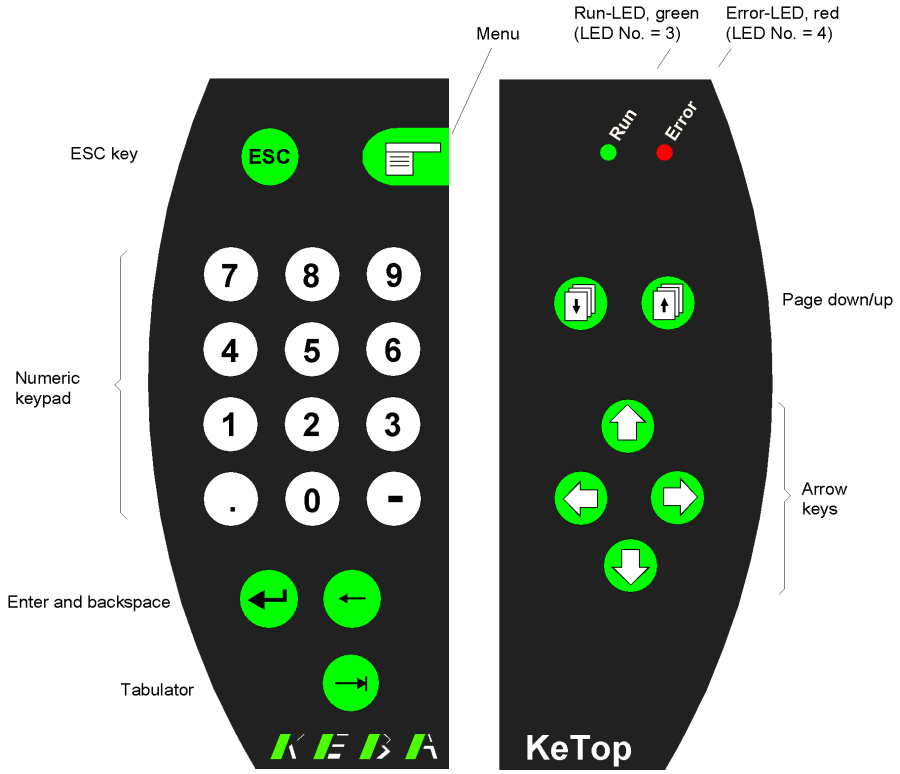


Fig.5-1: General membrane keypad for 7.7“ display

KEBA © KEBA 2009

5.1.2 8.4“ display (800x600 pixels)

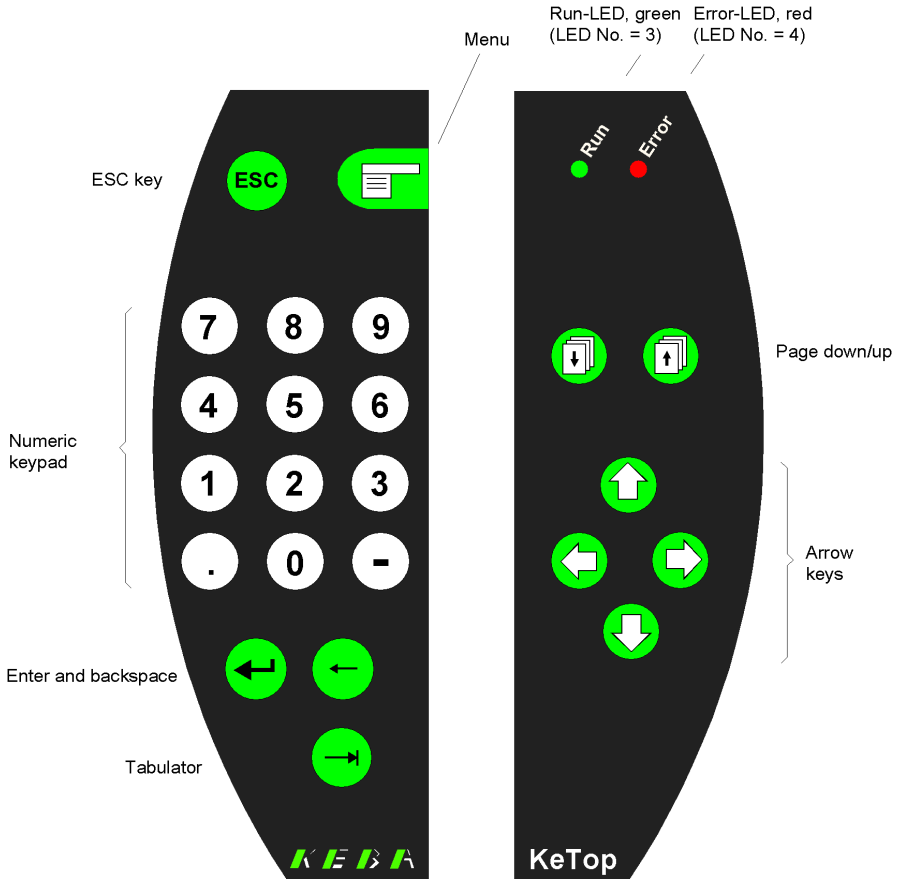


Fig.5-2: General membrane keypad for 8.4“ display

5.2 Robotics Membrane Keypad

The **keypad assignment** is stored in the registry and defined for the robotics membrane keypad as follows:

Key Labelling	Windows Virtual Key Code	Hex	Dec
Page Down	VK_NEXT	0x22	34
Page Up	VK_PRIOR	0x21	33
Cursor Up	VK_UP	0x26	38
Cursor Left	VK_LEFT	0x25	37
Cursor Right	VK_RIGHT	0x27	39
Cursor Down	VK_DOWN	0x28	40
Menu	VK_MENU	0x12	18
Enter	VK_RETURN	0x0D	13
Delete	VK_DELETE	0x2E	46
ESC	VK_ESCAPE	0x1B	27
Help (?)	VK_SHIFT + VK_SLASH	0x10 + 0xBF	16 + 191
Start	VK_1	0x31	49

© KEBA 2009

Stop	VK_0	0x30	48
V-	no VK Code defined	0xC1	193
V+	no VK Code defined	0xC2	194
A1-	no VK Code defined	0xC3	195
A1+	no VK Code defined	0xC4	196
A2-	no VK Code defined	0xC5	197
A2+	no VK Code defined	0xC6	198
A3-	no VK Code defined	0xC7	199
A3+	no VK Code defined	0xC8	200
A4-	no VK Code defined	0xC9	201
A4+	no VK Code defined	0xCA	202
A5-	no VK Code defined	0xCB	203
A5+	no VK Code defined	0xCC	204
A6-	no VK Code defined	0xCD	205
A6+	no VK Code defined	0xCE	206
Z+	no VK Code defined	0xCF	207
Z-	no VK Code defined	0xD0	208

Depending on the size of the display, two robotics membrane keypads are available:

5.2.1 7.7“ display (640x480 pixels)

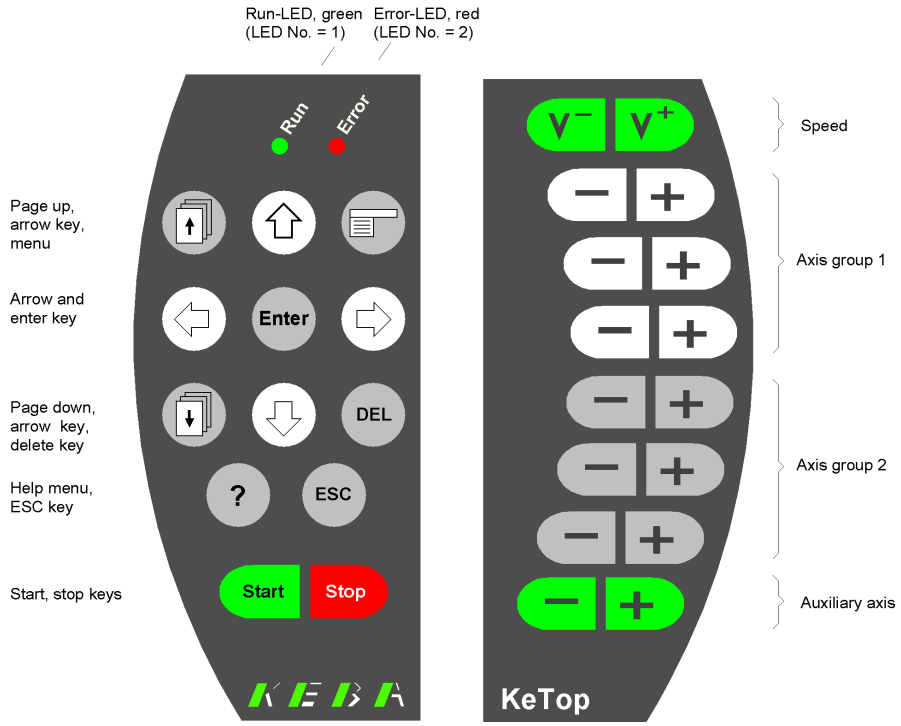


Fig.5-3: Robotics membrane keypad for 7.7“ display

© KEBA 2009

5.2.2 8.4“ display (800x600 pixels)

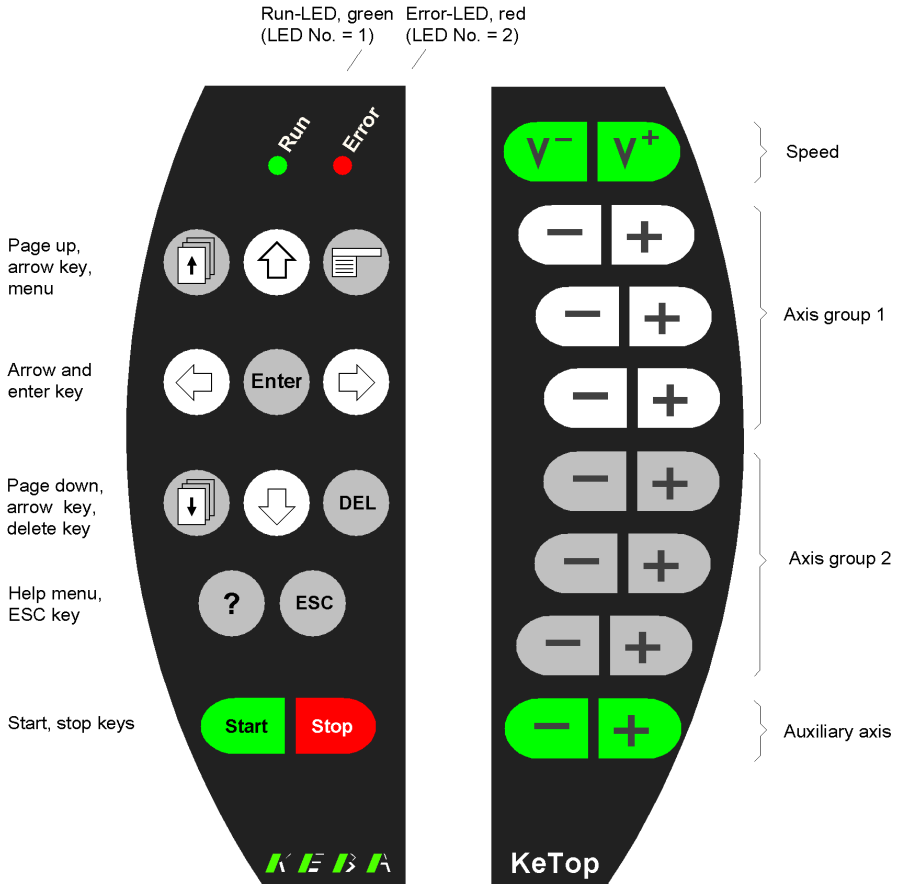


Fig.5-4: Robotics membrane keypad for 8.4” display

5.3 Numbering of LEDs

Numbering of LEDs

This chapter describes the numbering of the keyboard LEDs and push-button LEDs. The LED number is needed for activating the LED.

A LED can be activated in two ways:

- via **KeTop API design** (see *chapter 7.4.5 "LED Functions" on page 51*)
- via **KVC – KEBA Virtual Channel** (see *chapter 7.9.3 "Example: Interface on Server" on page 73*)

© KEBA 2009

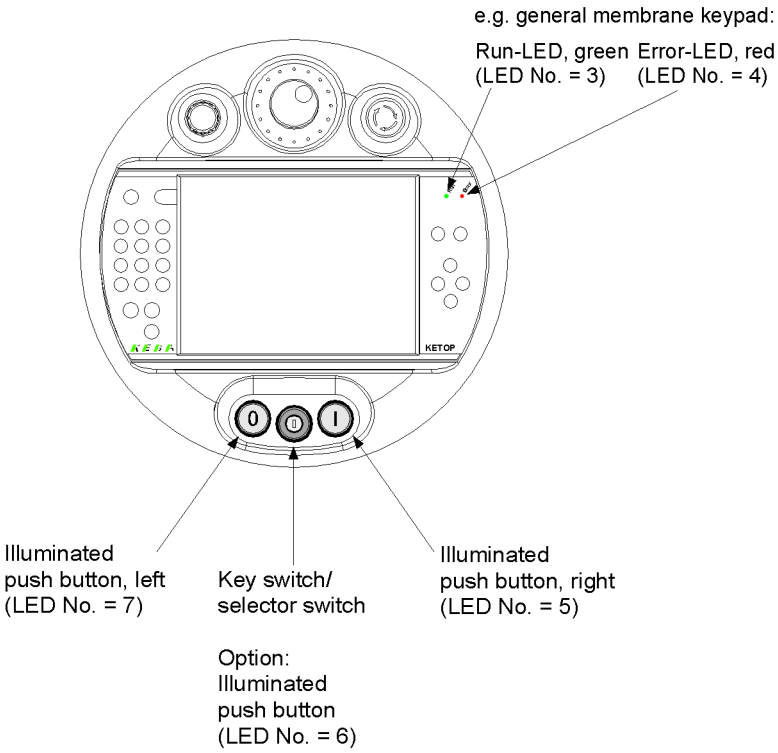

e.g. general membrane keypad:
Run-LED, green (LED No. = 3)
Error-LED, red (LED No. = 4)
KETOP
Illuminated push button, left (LED No. = 7)
Key switch/ selector switch
Option: Illuminated push button (LED No. = 6)
Illuminated push button, right (LED No. = 5)

Fig.5-5: Numbering of LEDs on KeTop

© KEBA 2009

6 Display

The KeTop is available with two displays which differ as to their resolution and screen diagonals:

	Display 7.7“	Display 8.4“
Type:	graphics-capable color STN LCD	graphics-capable color TFT display
Size:	7.7“ (160 x 120 mm)	8.4“ (175 x 130 mm)
Resolution:	VGA 640 x 480 pixels	SVGA 800 x 600 pixels
Representation:	256 colors	65535 colors
Background lighting:	CCFT cold cathode tube	CCFT cold cathode tube
Touch screen:	analog-resistive	analog-resistive

The lifetime of the background lighting (40,000 h) can be increased through the activation of a screen saver via the control panel. Procedure:

Start ▸ Settings ▸ Control Panel ▸ Display ▸ Folder Backlight

Select the function „Automatically turn off backlight while on external power“.

Here you can enter the turn-off time (30s to 30min).

6.1 Touch Screen

If the touch screen is not operated with the finger, we recommend using a touch stylus, for example touch styluses of PDAs by PALM or SONY.

The touch screen is already calibrated when the KeTop is delivered. No further calibration is required. If a re-calibration is required for any reason (humidity of air, temperature, etc.), perform the calibration procedure under Windows CE as follows:

Start ▸ Settings ▸ Control Panel ▸ Stylus ▸ Calibration ▸ Recalibrate

For the calibration you can also use the ConfigTool. See *chapter 8.2 "KeTop Configuration Tool (ConfigTool)" on page 81*.

© KEBA 2009

7 Software

7.1 Windows CE

The KeTop is delivered with pre-installed software that is stored in the flash of the device. This software is also called "Image" since it combines all software contents in one file. The image contains the Windows CE operating system core and possibly additional applications. The image is created by means of the MS Platformbuilder for Windows CE.

This description is valid for images from version 1.00.

(Get image version on KeTop as follows: ***Start*** ▸ ***Programs*** ▸ ***KeTop*** ▸ ***Version***)

Software of Standard KeTop:

- **Operating system Windows CE 4.2**:
  - System control
  - Command Prompt
  - Windows Explorer
  - Pocket Internet Explorer
- **Flash File System**:
  - IPSM (Intel Persistent Storage Manager)
- **Pre-installed application programs**:
  - Pocket Notepad
  - RDP-Client (Remote Desktop Connection)
  - Pocket Registry Editor (\windows\regedit.exe)
  - Active Sync
- **KeTop-specific software** (see ***Start*** ▸ ***Programs*** ▸ ***KeTop***):
  - KeTop Configuration Tool (extension in system control for configuration of contrast, background lighting, screensaver, touch screen and joystick calibration, clearing of registry, image update, ..)
  - KEBA Virtual Channel (KVC)
  - Registry Backup
  - SetTime, temporary time and date entry
  - TouchClean, Touch Cleaning Application
  - Version, overview of versions
  - Toggle sip (software keyboard)
- **Test tools**:
  - TestSerial, test program for serial interfaces (\windows\testserial.exe)
  - Reset (\windows\reset.exe)

KEBA © KEBA 2009

7.2 Generation of Program for Windows CE

The user can easily generate programs for Windows CE. Programming is similar to an application for a standard MS Windows NT PC. Under Windows CE, only the number of available WIN32-APIs is limited.

Prerequisites for Application Programming:

- **Microsoft eMbedded Visual C++ 4.0, Visual Studio 2003 / 2005**
- **SDK** (Software Development Kit) by manufacturer of Windows CE device (KEBA).

  The SDK provides to the programming environment the processor-dependent header and library files of the OEM adaptation. (If special hardware-dependent functions of the KeTop should be used, the SDK of the KeTop must be installed subsequently since the standard SDK for HPC (Handheld PC) and HPC Pro (Handheld PC Professional) does not take into account certain customer-specific adaptations.)

7.3 KeTop API Design

The entire SDK is implemented in a single dynamic link library (DLL). All functions described in this document are exported from the DLL <\windows\KeTopAPI.dll>. This file and the corresponding SDK are contained on the CD "KeTop SK001".

The following platform names are assigned to the KeTops:

KeTop T100:	KETOPT100
KeTop T50VGA:	KETOPT50VGA
KeTop T41:	KETOPT41

System files that are copied to \windows directory by Visual Studio remain stored permanently. For this reason, these files must be copied manually to the directory \IPSM\windows (must be created by the user if necessary).

In case of a restart of Windows CE, these files are automatically copied to the \windows directory. Therefore these files will be available for the operating system and after a restart.

7.3.1 Common data types

This section contains a detailed description of the common data types for the communication with the handheld terminal. For further information, see TpuHwDataTypes.h.

INT8	Signed 8 bit integer variable.
UINT8	Unsigned 8 bit integer variable.
BacklightStat	Enum, displays the backlight status
JoystickPos	Struct, for joystick data.
Status Struct	Describes the startup state of the device.
EventMsg	Enum, describes the event message received.

© KEBA 2009

EventMsgDomains	Enum, describes the events a handler has been subscribed to.
eventCallback	Function pointer to callback function.

7.3.2 Handling of Errors

7.3.2.1 Rules

- All functions expecting any input parameter check if the parameter is located inside the range and if its data type is correct. If a parameter is located outside the range the function will return INVALID_ARG_RANGE.
- All functions expecting a pointer for output data as parameter check if the pointer is valid, i.e. the pointer must not be NULL. If the pointer is invalid, the function will return INVALID_ARG_INVALID_PTR.
- All functions having any string as parameter check if the pointer to the string is valid. If the pointer is invalid, the function will return INVALID_ARG_INVALID_STR_PTR.

7.3.2.2 Defines

SUCCESS	0
OK	0
FAIL	1
INVALID_ARG_RANGE	2
INVALID_ARG_PTR	3
INVALID_ARG_STR_PTR	4
INVALID_ARG_UNKNWN_COOKIE	5
INVALID_ARG_UNKNWN_DOMAIN	6
INVALID_NOT_CALIBRATED	7
INVALID_POTI_NOT_CALIBRATED	8
UNSAVE_DLL_TERMINATION	-100
API_NOT_INIT	-101

7.4 Functions

7.4.1 Functions for starting and closing

This chapter describes functions that are needed for starting and closing the KetopApi.dll.

KtpAPIInit

Declaration	`UINT8 KtpAPIInit(void);`
Description	This method initializes the KetopAPI.
Arguments	-

KEBA © KEBA 2009

KtpAPIDeinit

Declaration	`void KtpAPIDeinit(void);`
Description	This method cancels all initializations of the KtpAPIInit.
Arguments	-

7.4.2 Functions for Configuration

This section describes the functions that are available for the configuration of the device. All functions return one of the above defines as error code.

KtpSetBrightness

Declaration	`UINT8 KtpSetBrightness(/*[in]*/UINT8 u8_Brightness);`
Description	This method sets the brightness of the LC display on the device.
Arguments	0-7, 0 = min, 7 = max

KtpSetBrightnessPercent

Declaration	`UINT8 KtpSetBrightnessPercent(/*[in]*/UINT8 u8_Brightness);`
Description	This method sets the brightness of the LC display on the device in percent.
Arguments	0-100%

KtpSetContrast

Declaration	`UINT8 KtpSetContrast(/*[in]*/UINT8 u8_Contrast);`
Description	This method sets the contrast of the LC display on the device.
Arguments	0-31, 0 = min, 31 = max (Ketop T50: 0-63, 0 = min, 63 = max)

KtpSetContrastPercent

Declaration	`UINT8 KtpSetContrastPercent(/*[in]*/UINT8 u8_Contrast);`
Description	This method sets the contrast of the LC display on the device in percent.
Arguments	0-100%

KtpSwitchBacklight

Declaration	`UINT8 KtpSwitchBacklight(/*[in]*/BacklightStat backLight);`
Description	Turns on/off the backlight of the LC display on the device.
Arguments	BACKLIGHT_ON, BACKLIGHT_OFF

KtpSetScreenSaverTimeOutMin

Declaration	`UINT8 SetScreenSaverTimeOutMin(/*[in]*/UINT8 u8_ScreenSaverTO);`
Description	Sets the timeout value of the screensaver in minutes.
Arguments	0-255, 0 = off, 255 = max

© KEBA 2009

KtpSetScreenSaverTimeOutSec

Declaration	`UINT8 SetScreenSaverTimeOutMin(/*[in]*/ UINT16u16_ScreenSaverTO);`
Description	Sets the timeout value of the screensaver in seconds.
Arguments	0-65535, 0 = off, 65535 = max

7.4.3 Functions for Reading the Configuration

These functions return the current value of the configuration parameters. None of the functions need any parameter. These functions do not enable checking for errors since the return value of the function is the value of the configuration parameter.

KtpGetBrightness

Declaration	`UINT8 KtpGetBrightness(void);`
Description	Gets the current brightness value of the LC display.
Arguments	-

KtpGetBrightnessPercent

Declaration	`UINT8 KtpGetBrightnessPercent(/*[out]*/UINT8 *u8_Brightness);`
Description	Gets the current brightness value of the LC display in percent.
Arguments	UINT8 *u8_Brightness: brightness value 0-100%

KtpGetContrast

Declaration	`UINT8 KtpGetContrast(void);`
Description	Gets the current contrast value of the LC display.
Arguments	-

KtpGetContrastPercent

Declaration	`UINT8 KtpSetContrastPercent(/*[out]*/UINT8 *u8_Contrast);`
Description	Gets the current contrast value of the LC display in percent.
Arguments	UINT8 *u8_Contrast: contrast value 0-100%

KtpGetBacklight

Declaration	`TKtpBacklightStat KtpGetBacklight(void);`
Description	Gets the current status of the background lighting.
Arguments	-

KtpGetScreenSaverTimeoutMin

Declaration	`UINT8 GetScreenSaverTimeOutMin(void);`
Description	Gets the current timeout value of the screensaver in minutes.
Arguments	-

KEBA © KEBA 2009

KtpGetScreenSaverTimeoutSec

Declaration	`UINT8 GetScreenSaverTimeOutSec(void);`
Description	Gets the current timeout value of the screensaver in seconds.
Arguments	-

7.4.4 Peripheral Functions

KtpJoystickIsInstalled

Declaration	`UINT8 KtpJoystickIsInstalled(void);`
Description	Returns the number of joystick axes. If no joystick is installed on the device, 0 will be returned.
Arguments	-

KtpWheelIsInstalled

Declaration	`UINT8 KtpWheelIsInstalled(void);`
Description	Returns 1 if an handwheel is installed on the device, otherwise 0.
Arguments	-

KtpPotiIsInstalled

Declaration	`UINT8 KtpPotiIsInstalled(void);`
Description	Returns 1 if an override potentiometer is installed on the device, otherwise 0.
Arguments	-

KtpGetJoystickPos

Declaration	`UINT8 KtpGetJoystickPos (/*[out]*/TKtpJoystickPos *p_jPos);`
Description	Gets the current joystick position.
Arguments	TKtpJoystickPos structure. Each component in the structure may only range between -15 and 15.
Remarks	Calling this function is only allowed if a joystick is installed on the device. If no joystick is installed the values of the components are undefined.

KtpGetJoystickPosEx

Declaration	`UINT8 KtpGetJoystickPosEx(/*[out]*/int *posX, int *posY, int *posZ);`
Description	Gets the current joystick position.
Arguments	Each component in the structure may only range between -15 and 15.
Remarks	Calling this function is only allowed if a joystick is installed on the device. If no joystick is installed the values of the components are undefined.

KtpGetJoystickPosRaw

Declaration	`UINT8 KtpGetJoystickPosRaw (/*[out]*/ TktpJoystickPosRaw *p_jPos);`
Description	Gets the actual raw data of the joystick.

© KEBA 2009

Arguments	-
Remarks	Calling this function is only allowed if a joystick is installed on the device. If no joystick is installed the values of the components are undefined.

KtpGetJoystickPosRawEx

Declaration	`UINT8 KtpGetJoystickPosEx(/*[out]*/UINT16 *posX, UINT16 *posY, UINT16 *posZ);`
Description	Gets the actual raw data of the joystick.
Arguments	-
Remarks	Calling this function is only allowed if a joystick is installed on the device. If no joystick is installed the values of the components are undefined.

KtpSetJoystickCalibData

Declaration	`UINT8 KtpSetJoystickCalibData(/*in*/ TKtpJoystickChannel ch UINT16 rawMin, UINT16 rawCenter , UINT16 rawMax, UINT16 calibRange);`
Description	Calibrates the axis of the joystick.
Arguments	TktpJoystickChannel ch: channel to be calibrated. UINT16 rawMin: value for smallest raw value UINT16 ramCenter: average value for raw data UINT16 rawMax: maximum value of raw data UINT16 calibRange: maximum range of joystick
Remarks	Calling this function is only allowed if a joystick is installed on the device. If no joystick is installed the values of the components are undefined.

KtpGetOverridePoti

Declaration	`UINT8 KtpGetOverridePoti(/*out*/UINT8 *p_pos);`
Description	Gets the current value of the override potentiometers.
Arguments	Pointer to the variable containing the current value of the override potentiometer.
Remarks	This function may only be called if a override potentiometer is installed on the device. If no override potentiometer is installed, the value of the components are undefined.

KtpGetOverridePotiRaw

Declaration	`UINT8 KtpGetOverridePotiRaw(/*out*/UINT16 *p_pos);`
Description	Gets the uncalibrated value from the override potentiometer.
Arguments	Pointer to the variable containing the current value of the override potentiometer.
Remarks	This function may only be called if a override potentiometer is installed on the device. If no override potentiometer is installed, the value of the components are undefined.

KEBA © KEBA 2009

KtpGetEnablingDevice

Declaration	`UINT8 KtpGetEnablingDevice(/*in*/TKtpEnablingDeviceCircuit circuit);`
Description	Circuit is the value of the enabling switch to be read out when it is pressed completely (panic position).
Arguments	Returns the current value of the enabling switch transferred in the circuit.
Remarks	This function may only be called if a enabling switch is installed on the device. If no enabling switch is installed, the value of the components are undefined.

KtpSetPotiCalibData

Declaration	`UINT8 KtpSetPotiCalibData(/*in*/ UINT16 rawMin, UINT16 rawMax, UINT16 calibRange);`
Description	Calibration of override potentiometer.
Arguments	UINT16 rawMin: value for smallest raw value UINT16 rawMax: maximum raw value UINT16 calibRange: maximum range of overridepoti
Remarks	This function may only be called if an override potentiometer is installed on the device. If no override potentiometer is installed, the value of the components are undefined.

KtpGetWheelValue

Declaration	`UINT8 KtpGetWheelValue(/*out*/UINT16 *p_val);`
Description	Gets the actual value of the handwheel.
Arguments	Pointer to the variable containing the current value of the handwheel.
Remarks	This function may only be called if a handwheel is installed on the device. If no handwheel is installed, the value of the components are undefined.

KtpSetWheelValue

Declaration	`UINT8 KtpSetWheelValue(/*in*/UINT16 val);`
Description	Sets the current position of the handwheel to the value transferred in val.
Arguments	val is the value the handwheel should be set to.
Remarks	This function may only be called if a handwheel is installed on the device. If no handwheel is installed, the value of the components are undefined.

7.4.5 LED Functions

The value for argument LED number (ledNr) which is required for the following functions can be found in *"Numbering of LEDs" on page 41*.

KtpSetKeyboardLed

Declaration	`UINT8 KtpSetKeyboardLed(/*in*/UINT8 ledNr, TLedState ledState);`
Description	Switches the set LED to the desired state.
Arguments	UINT8 ledNr: number of LED to be set. UINT ledState: state, the LED is set to.

© KEBA 2009

KtpGetKeyboardLed

Declaration	`TLedState KtpGetKeyboardLed(/*in*/UINT8 ledNr);`
Description	Returns the state of the desired LED.
Arguments	UINT8 ledNr: number of LED.

7.4.6 Other functions

These functions perform various actions on the device.

KtpGetStatus

Declaration	`UINT8 KtpGetStatus(/*[out]*/Status *p_tpuStatus);`
Description	Gets the start-up state of the handheld terminal.
Arguments	Status *p_tpuStatus, pointer to memory area that will receive a copy of the status structure.

KtpWriteToFlash

Declaration	`UINT8 WriteToFlash(void);`
Description	Writes the registry of the device to the flash.
Arguments	-

KtpReset

Declaration	`UINT8 KtpReset(void);`
Description	Restarts the device new.
Arguments	-

KtpGetVersionString

Declaration	`UINT8 KtpGetVersionString(/*out*/TCHAR *wszVersionString, unsigned int bufferLen);`
Description	Returns the state of the KeTop during start-up.
Arguments	TCHAR *wszVersionString: pointer to buffer for the versions string unsigned int bufferSize: length of transferred buffer.

KtpGetEEPromData

Declaration	`UINT8 KtpGetEEPromData(/*out*/TEEPromData *data);`
Description	Read the data from the EEProm
Arguments	TEEPromData data: data structure for the data contained in the EEProm

KtpWriteByteToEEProm

Declaration	`UINT8 KtpWriteByteToEEProm (/*in*/UINT16 addr, UINT8 data);`
Description	Writes a byte to the EEProm location transferred in addr.
Arguments	UINT16 addr: address of memory location UINT8 data: data for saving

KEBA © KEBA 2009

KtpReadByteFromEEProm

Declaration	`UINT8 KtpReadByteFromEEProm (/*in*/UINT16 addr, /*out*/ UINT8 *pData);`
Description	Reads a byte from the EEProm location transferred in addr.
Arguments	UINT16 addr: address of memory location UINT8 *pData: data from the EEProm

KtpLaunchTouchScreenCalibApp

Declaration	`UINT8 KtpLaunchTouchScreenCalibApp (void);`
Description	Starts the touch-screen calibration tool.
Arguments	-

KtpGetTemperature

Declaration	`UINT8 KtpGetTemperature (void);`
Description	Returns the current temperature of the KeTop.
Arguments	-

KtpDoBeep

Declaration	`UINT8 KtpDoBeep (/*in*/ UINT8 beepTime10ms);`
Description	Is active for beepTime10ms * 10 ms
Arguments	UINT8 beeptime10ms: duration of beeps in n* 10ms

KtpGetVariantData

Declaration	`UINT8 KtpGetVariantData (/*out*/ TKtpVariant-Data *data);`
Description	Reads the device configuration from the EEProm.
Arguments	TKtpVariantData data: data structure for VariantData.

7.4.7 Functions for Subscribing Events

These functions are used to subscribe/unsubscribe callback functions for different events. Joystick, override potentiometer, handwheel and keypad can be used as events.

KtpInstallWheelEventCallback

Declaration	`UINT8 KtpInstallWheelEventCallback (/*in*/ TktpWheelEventCallback pWheelProc, int *cook-ie);`
Description	Subscribes a callback function for the WheelEvent and returns an index (cookie) for the callback function.
Arguments	TKtpWheelEventCallback pWheelProc: callback function to be called when the event occurs. int cookie: The index for the callback function is required for removing the callback function.

© KEBA 2009

KtpInstallWheelEventMessage

Declaration	`UINT8 KtpInstallWheelEventMessage (HWND hWnd, int *cookie);`
Description	Subscribes a WindowHandler for the WheelEvent and returns an index (cookie).
Arguments	HWND hWnd: WindowHandler, where the message is sent to. int cookie: Index, is required for removing the WindowHandler.

KtpRemoveWheelEventCallback

Declaration	`UINT8 KtpRemoveWheelEventCallback (int cookie);`
Description	Removes the WheelEventCallback function.
Arguments	int cookie: index for the callback function to be removed.

KtpRemoveWheelEventMessage

Declaration	`UINT8 KtpRemoveWheelEventMessage (int cookie);`
Description	Removes the WindowHandler.
Arguments	int cookie: index for the WindowHandler to be removed.

KtpInstallOvrEventCallback

Declaration	`UINT8 KtpInstallOvrEventCallback (/*in*/ TKtpOvrEventCallback pOvrProc, /*out*/ int *cookie);`
Description	Subscribes a callback function for the OverrideEvent and returns an index (cookie) for the callback function.
Arguments	TKtpOvrEventCallback pOvrProc: callback function to be called when the event occurs. int cookie: The index for the callback function is required for removing the callback function.

KtpInstallOvrEventMessage

Declaration	`UINT8 KtpInstallOvrEventMessage (HWND hWnd, int *cookie);`
Description	Subscribes a WindowHandler for the OverrideEvent and returns an index (cookie) for the WindowHandler.
Arguments	HWND hWnd: WindowHandler, where the message is sent to. int cookie: Index, is required for removing the WindowHandler.

KtpRemoveOvrEventCallback

Declaration	`UINT8 KtpRemoveOvrEventCallback (int cookie);`
Description	Removes the OverrideEventCallback function.
Arguments	int cookie: index for the callback function to be removed.

KEBA © KEBA 2009

KtpRemoveOvrEventMessage

Declaration	`UINT8 KtpRemoveOvrEventMessage (int cookie);`
Description	Removes the WindowHandler.
Arguments	int cookie: index for the WindowHandler to be removed.

KtpInstallKbdEventCallback

Declaration	`UINT8 KtpInstallKbdEventCallback (/*in*/ TktpKbdEventCallback pKbdProc, /*out*/ int *cookie);`
Description	Subscribes a callback function for the KeyboardEvent and returns an index (cookie) for the callback function.
Arguments	TktpKbdEventCallback pKbdProc: callback function to be called when the event occurs. int cookie: The index for the callback function is required for removing the callback function.

KtpInstallKbdEventMessage

Declaration	`UINT8 KtpInstallKbdEventMessage (HWND hWnd, int *cookie);`
Description	Subscribes a WindowHandler for the KeyboardEvent and returns an index (cookie) for the WindowHandler.
Arguments	HWND hWnd: WindowHandler, where the message is send to. int cookie: The index for removing the WindowHandler.

KtpRemoveKbdEventCallback

Declaration	`UINT8 KtpRemoveKbdEventCallback (int cookie);`
Description	Removes the WheelEventCallback function.
Arguments	int cookie: index for the callback function to be removed

KtpRemoveKdbEventMessage

Declaration	`UINT8 KtpRemoveKbdEventMessage (int cookie);`
Description	Removes the WindowHandler.
Arguments	int cookie: index for the WindowHandler to be removed

KtpInstallJoyEventCallback

Declaration	`UINT8 KtpInstallJoyEventCallback (/*in*/ TktpJoyEventCallback pJoyProc, /*out*/ int *cookie);`
Description	Subscribes a callback function for the JoystickEvent and returns an index (cookie) for the callback function, if a joystick is installed.
Arguments	TktpJoyEventCallback pJoyProc: callback function to be called when the event occurs. int cookie The index for the callback function is required for removing the callback function.

© KEBA 2009

KtpInstallJoyEventMessage

Declaration	`UINT8 KtpInstallJoyEventMessage (HWND hWnd, int *cookie);`
Description	Subscribes a WindowHandler for the JoystickEvent and returns an index (cookie) for the WindowHandler.
Arguments	HWND hWnd: WindowHandler, where the message is send to. int cookie: index for the WindowHandler to be removed

KtpRemoveJoyEventCallback

Declaration	`UINT8 KtpRemoveJoyEventCallback (int cookie);`
Description	Removes the JoyEventCallback function, if a joystick is installed.
Arguments	int cookie: index for the callback function.

KtpRemoveJoyEventMessage

Declaration	`UINT8 KtpRemoveJoyEventMessage (int cookie);`
Description	Removes the WindowHandler.
Arguments	int cookie: index for the WindowHandler to be removed

KtpLaunchJoystickCalibApp

Declaration	`UINT8 KtpLaunchJoystickCalibApp(HANDLE *pProcHandle);`
Description	Starts the joystick calibration tool.
Arguments	HANDLE *pProcHandle: Handle for the started program.

KtpGetDisplayRotation

Declaration	`TKtpDispalyRot KtpGetDisplayRotation (void);`
Description	Returns the state for the DisplayRotation (for left or right handers).
Arguments	-

KtpSetDisplayRotation

Declaration	`UINT8 KtpSetDisplayRotation(TKtpDisplayRot dispRot);`
Description	Changes the design of the display for left or right handers. Maybe for some devices no changes.
Arguments	TKtpDisplayRot dispRot: eKtpDisplayLeft for left handers, eKtpDisplayRight for right handers

KtpEraseRegistry

Declaration	`UINT8 KtpEraseRegistry(void);`
Description	Deletes the registry of the device during next startup.
Arguments	-

KtpErasePSM

Declaration	`UINT8 KtpErasePSM(void);`
Description	Deletes the flash file system of the device during next startup.
Arguments	-

KEBA © KEBA 2009

KtpGetPowerFailState

Declaration	`UINT8 KtpGetPowerFailState(void);`
Description	Returns the actually state of the powerFail input.
Arguments	-

KtpForcePressedHardbuttons

Declaration	`UINT8 KtpForcePressedHardbuttons (void);`
Description	A WM_KEYDOWN message will be send for each pressed keyswitch and the KeyboardCallback function will be activated. This function will be activated also for the initializing of the KetopApi and for the installation of the KeyboardCallback function.
Arguments	-

KtpIsJoystickCalibrated

Declaration	`UINT8 KtpIsJoysstickCalibrated (void);`
Description	Returns OK (0) if all joystick axes are calibrated. If one or more axes are not calibrated, it returns INVALID_NOT_CALIBRATED (7). If no joystick exists, it returns INVALID_NOT_SUPPORTED (6).
Arguments	-

KtpIsPotiCalibrated

Declaration	`UINT8 KtpIsPotiCalibrated (void);`
Description	Returns OK (0) if the override potentiometer is calibrated. Returns INVALID_NOT_CALIBRATED (7), if it is not calibrated. Returns INVALID_NOT_SUPPORTED (6) if no override potentiometer is installed.
Arguments	-

KtpRestoreMemorySettings

Declaration	`UINT8 KtpRestoreMemorySettins(void);`
Description	Saves the registry-value of the path "System\MemorySettings\ StorePages" as storage memory. If the registry-value is in a range where memory for storage respectively for program memory is reserved, these settings wont be changed and INVALID_ARG_RANGE will be returned. If it is not allowed to save the memory settings ("System\MemorySettings \MemorySaveEnable"=0), INVALID_NOT_SUPPORTED will be returned.
Arguments	-

KtpStoreCurrentMemorySettings

Declaration	`UINT8 KtpStoreCurrentMemorySettins(void);`
Description	Saves the memory settings of the registry ("System\MemorySettings\StorePages"), if it is allowed. If it is not allowed to save, INVALID_NOT_SUPPORTED will be returned.
Arguments	-

© KEBA 2009

KtpShowInputPanel

Declaration	`UINT8 KtpShwoInputPanel(UINT8 show);`
Description	Opens (show=1) or closes (show=0) the input panel on the display and returuns OK or FAIL.
Arguments	-

7.5 Update API Design

All required methods for an image update are implemented in one single dynamic link library (update.dll). All functions described in this document are exported from this DLL.

For running the update.dll the appropriate KetopAPI.dll will be necessary. Both DLL files must exist in the image and correspond with each other.

7.5.1 Handling of Errors

7.5.1.1 Rules

- All functions expecting any input parameter check if the parameter is located inside the range and if its data type is correct. If a parameter is located outside the range the function will return ERROR_INVALID_RANGE.

7.5.1.2 Defines

SUCCESS	0
OK	0
FAIL	1
ERROR_INVALIDE_RANGE	100
ERROR_IMGUPD_INIT	101
ERROR_IMGUPD_FILEOPEN	102
ERROR_IMGUPD_WRONGIMG	103
ERROR_IMGUPD_PROGRAMERROR	104
ERROR_IMGUPD_TOMUCHUPD	105
ERROR_PROGRAM_FLASH_BURN	106
ERROR_PROGRAM_FLASH_ERASE	107
ERROR_IMGUPD_NOTEQUAL	108
ERROR_IMGUPD_FILEWRITE	109
ERROR_IMGUPD_FILEREAD	110
ERROR_WRONG_FILE_HEADER	111

7.6 Initialising

All required initialisation will be carried out by starting respectively by loading the update.dll.

KEBA © KEBA 2009

7.6.1 Functions

UpdStartImageUpdate

Declaration	`BOOL UpdStartImageUpdate (LPCTSTR fileName, BOOL eraseRegPSM, TUpdProgressCallback pCallback)`
Description	With this method the file handed over by fileName will be stored to the FLASH memory of the device. If `eraseRegPSM` is set, the registry respectively the PSM will be deleted, after the FLASH has been written successfully. If a method is handed over with `pCallback`, the method will be executed depending of the program progress. The method returns OK or the corresponding error message.
Arguments	`LPCTSTR fileName`: Name of the image file `BOOL eraseRegPSM`: Flag for deleting the registry respectively the PSM `TUpdProgressCallback pCallback`: Callback function for program progress or 0

UpdPartialImageUpdate

Declaration	`BOOL UpdPartialImageUpdate (LPCTSTR fileName, unsigned long from, unsigned long to, BOOL eraseRegPSM, TUpdProgressCallback pCallback)`
Description	With this method the file handed over by `fileName` will be stored from the address `from` to the address `to` to the FLASH memory of the device. If `eraseRegPSM` is set, the registry respectively the PSM will be deleted, after the FLASH has been written successfully. If a method is handed over wirh `pCallback`, the method will be executed depending of the program progress. The method returns OK or the corresponding error message.
Arguments	`LPCTSTR fileName`: Name of image file `unsigned long from`: First address for overwriting `unsigned long to`: Addrass, out of overwriting `BOOL eraseRegPSM`: Flag for deleting the registry respectively the PSM `TUpdProgressCallback pCallback`: Callback function for program progress or 0

© KEBA 2009

UpdCheckFile

Declaration	`BOOL UpdCheckFile(LPCTSTR fileName, TupdProgressCallback pCallback)`
Description	`UpdCheckFile` verifys the image file and if the image file corresponds to the device. If a method is handed over wirh `pCallback`, the method will be executed depending of the program progress. The method returns OK or the corresponding error message.
Arguments	`LPCTSTR fileName`: Name of image file `TUpdProgressCallback pCallback`: Callback function for program progress or 0

UpdCompareFile

Declaration	`BOOL UpdCompareFile(LPCTSTR fileName, TUpdProgressCallback pCallback);`
Description	`UpdCompareFile` compares the handed over image file with the entries of the FLASH memory. If a method is handed over wirh `pCallback`, the method will be executed depending of the program progress. The method returns OK or the corresponding error message.
Arguments	`LPCTSTR fileName`: Name of image file `TUpdProgressCallback pCallback`: Callback function for program progress or 0

UpdSetFlashLock

Declaration	`BOOL UpdSetFlashLock(long from, long to);`
Description	This method sets the lock bits of the FLASH chips from the address `from` to the address `to`. So, this address area can't be overwritten. After an image update, the lock bits are reset. One lock bit locks one whole FLASH block. So the saved area can differ from the handed over addresses.
Arguments	`long from`: First address for locking bits. `long to`: Address as far as the lock bits are set.

UpdResetFlashLock

Declaration	`BOOL UpdResetFlashLock(long from, long to);`
Description	This method resets the lock bits of the FLASH chips from the address from to the address to, One lock bit locks one whole FLASH block. So the unsaved area can differ from the handed over addresses.
Arguments	`long from`: First address for reset locking bits. `long to`: Address as far as the lock bits are reset.

KEBA © KEBA 2009

UpdGetImage

Declaration	`BOOL UpdGetImage(LPCTSTR fileName, unsigned lont from, unsigned long to, TUpdProgress-Callback pCallback);`
Description	`UpdGetImage` creates a copy of the device-image from the address `from` to the address `to` and saves it in the file `fileName`. If a method is handed over with `pCallback`, the method will be executed depending of the program progress. The method returns OK or the corresponding error message.
Arguments	`LPCTSTR fileName`: Name of image file `unsigned long from`: Starting address stored in the file `unsigned long to`: Address not stored `TUpdProgressCallback pCallback`: Callback funktion for program progress or 0

UpdEraseRegistry

Declaration	`BOOL UpdEraseRegistry();`
Description	The method `UpdEraseRegistry` clears the registry of the device after the next update.

UpdErasePSM

Declaration	`BOOL UpdErasePSM();`
Description	The method `UpdErasePSM` clears the PSM of the device after the next update.

UpdResetDevice

Declaration	`BOOL UpdResetDevice();`
Description	The method `UpdResetDevice` resets the device.

UpdGetFileVersion

Declaration	`BOOL UpdGetFileVersion(LPCTSTR fileName, LPTSTR version);`
Description	`UpdGetFileVersion` returns the version information stored in the image file in the string version. The number of characters returned can be defined in `VERSION_STRING_LEN`. Therefore version has to exceed `VERSION_STRING_LEN`.
Arguments	`LPCTSTR fileName`: Name of image file `LPTSTR version`: String for version information

© KEBA 2009

UpdGetImageVersion

Declaration	`BOOL UpdGetImageVersion(LPTSTR version);`
Description	`UpdGetImageVersion` returns the version information stored in registry (string version). The number of characters returned is defined in `VERSION_STRING_LEN`. Therefore version has to exceed `VERSION_STRING_LEN`.
Arguments	`LPTSTR version`: String for version information

TUpdProgressCallback

Declaration	`typedef void (* TUpdProgressCallback) (int percent);`
Description	`TUpdProgressCallback` is the prototype of the callback functions, which can be called from the Update API.
Arguments	`int percent`: Number between 0 and 100 for the progress

7.7 Program for Starting the Application and KeTop API

This chapter describes the program for starting the application and the KeTop API. The program is contained as a StartAPI.exe in the Windows directory.

7.7.1 Functional description

The StartAPI program is started by an entry in the Startup directory or by an entry in the registry under [HKEY_LOCAL_MACHINE\init] when the KeTop is started.

When the program is started, the KeTop API will be initialized first and then the programs entered under [HKEY_LOCAL_MACHINE\Autostart] will be started.

The program remains invisible in the memory and handles different input devices, e.g. override potentiometer and handwheel.

7.7.2 Registry entries

[HKEY_LOCAL_MACHINE\Autostart] contains the entries that are read out by the program.

The following entries are possible:

- **Startx**

  string identifying the program to be started. x is a number between 1 and 255.

- **Paramsx**

  string containing the parameters for the program identified in Startx. x must have the same value as in Startx.

- **Delayx**

KEBA © KEBA 2009

DWORD containing the waiting time in milliseconds until the next program is started. x must have the same value as in Startx.

- **DependStartx**

  array of 10 bytes containing the numbers of the programs which must have been started before the program x starts. If there is no such entry or all bytes are 0 then the program x starts without waiting of any other programs.

- **DependEndx**

  array of 10 bytes containing the numbers of the programs which must have been stopped before the program x starts. If there is no such entry or all bytes are 0 then the program x starts without waiting of any other programs.

- **StartTypex**

  DWORD affecting the startup of the application.

  StartTypex = 0: The application starts automatically

  StartTypex = 1: The application wont be started

  StartTypex = 2: A window with the message „start programm <Yes> / <No>“ appears. The user can decide, if the application should be started or not.

  x must have the same value as Startx.

7.7.3 Example

Example of a possible configuration in the registry of the KeTop T50VGA Image Vers. 1.06: (shown with a pocket registry editor):

[HKEY_LOCAL_MACHINE\Autostart]

Start1 = "cmd.exe"

Params1 = “/c DirCopy \\ipsm\\Windows \\windows"

Delay1 = 0x00000100 (256)

StartType1 = 0x00000000 (0)

Start2 = "Explorer.exe"

Params2 = ""

Delay2 = 0x00000100 (256)

StartType2 = 0x00000000 (0)

DependEnd2 = 01 00 00 00 00 00 00 00 00 00

DependStart2 = 00 00 00 00 00 00 00 00 00 00

Start10 = "SetTime.exe"

Params10 = "/onstartup"

Delay10 = 0x00002000 (8192)

StartType10 = 0x00000000 (0)

First the entry „Start1“ will be executed.

© KEBA 2009

The call of "cmd.exe /c DirCopy \ipsm\Windows \windows" causes, that all sub direkctories and data from the directory \ipsm\windows will be copied to the normal Windows directory.

Because each windows application has its own window, all “Start..” entries can be executed at the same time.

The entry “Delay1“ delays the application “explorer.exe“at least for 256 ms.

Furthermore the entry ”DependEnd2 = 01 …” forces a dependence to the application before. This causes, that “explorer.exe” does not start, before the application “cmd.exe” has been finished.

"Start10 = SetTime.exe" causes the call of the entry window for setting date and time.

If no more entries are available, the start processs of the applications will be finished.

Programs, started by StartAPI, wont be finished.

TSCDialog.exe can be exited by pressing the button “Service”. User has to enter a password (default: “keba”) which can be changed.

7.8 RDP - Connection via Remote Desktop Protocol

The **R**emote **D**esktop **P**rotocol (Abbreviated as"RDP“) is a specification by Microsoft for remote control of applications. Microsoft has replaced the earlier name "**M**icro**s**oft **T**erminal **S**erver **C**lient" (Abbreviated as "MSTSC") by the term RDP-Client.

A detailed description of this term can be found on Microsoft's website. Likewise, it can also be found in the Windows-Help feature using the search criteria “mstsc” and “rdp”.

Operating principle (highly simplified):

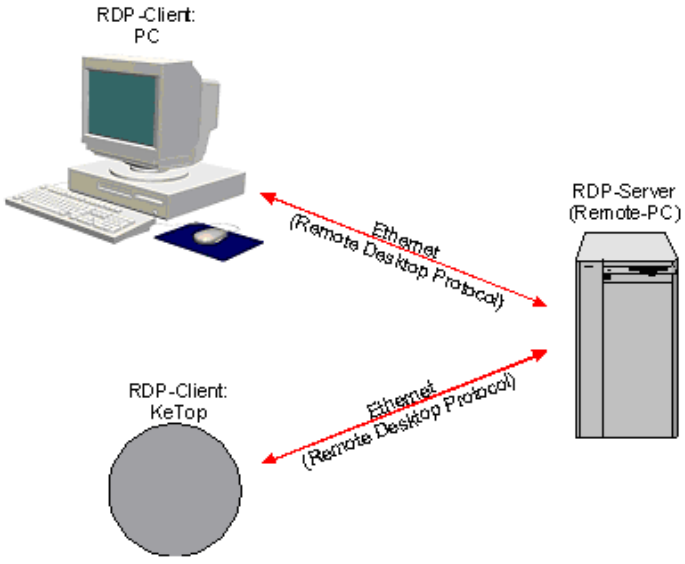


Fig.7-1: RDP-Client ↔ RDP-Server

KEBA © KEBA 2009

Programs and data are stored on the remote computer. This is where the program is executed and the data is accessed. This remote computer (Remote PC) is identified as ”RDP-Server“.

However, data is entered and displayed on the monitor of the local “RDP-Client".

The exchange of data between the client and the server takes place as per the "Remote Desktop Protocol".

7.8.1 RDP-Server (Remote-PC)

The RDP-Server (Remote-PC) requires one of the following operating systems:

- Windows NT4 Terminal server
- Windows 2000 Server
- Windows 2003 (Server)
- Windows XP Professional (Not Windows XP Home!)
- Windows XP embededded (The Server-functionality is integrable.)

Information

When using Windows XP Professional, the RDP-access on the PC in use, must be enabled using the path below: ***Control Panel ▸ System ▸ Remote*** *(The option "Remotedesktop" must be activated).*

7.8.2 RDP-Client (PC)

To start the RDP-Client on the PC, the file `mstsc.exe` must be invoked. In Windows XP, this can be found in the Windows directory or under ***Start ▸ All Programs ▸ Accessories ▸ Communication ▸ Remote Desktop Connection***.

For other operating systems such as Windows 95/98/NT, the appropriate files can be obtained from the Microsoft website.

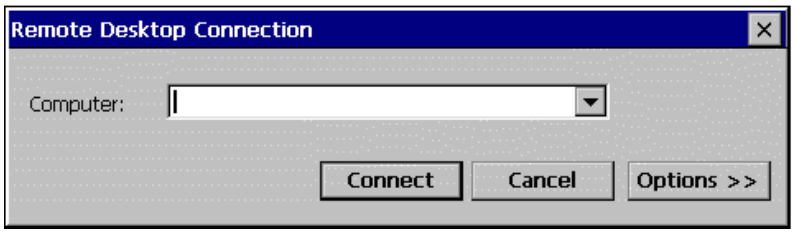
7.8.3 RDP-Client (KeTop)

When starting the client on the KeTop, the file `cetsc.exe` must be invoked. This is located in the Windows directory and can be accessed using the path ***Start ▸ Programs ▸ Remote Desktop Connection***.

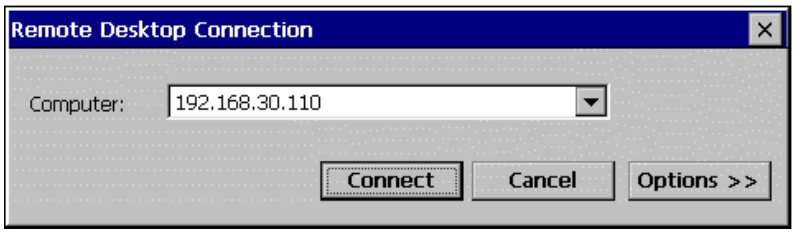
7.8.3.1 Starting a RDP-Connection manually

1) Start the RDP-client using the file `cetsc.exe` and the login window shown below, appears:

© KEBA 2009

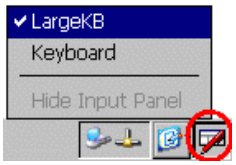


2) Enter the IP-Address of the destination computer in the field “Computer”.

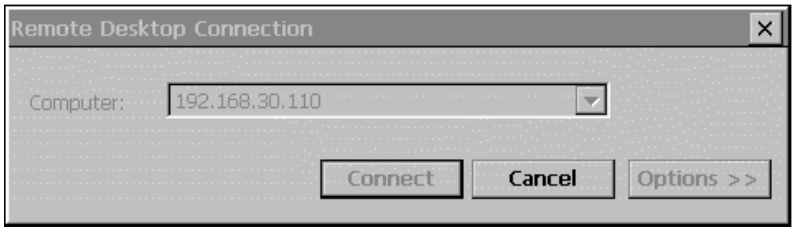


In case the network name is to be used in place of the IP-Address, then resolution of the name must be ensured either via the DNS-server or by an entry in the file “hosts.ini”.

The “Input panel” in this case must be enabled on the KeTop, as access to this feature is blocked during the logging process:



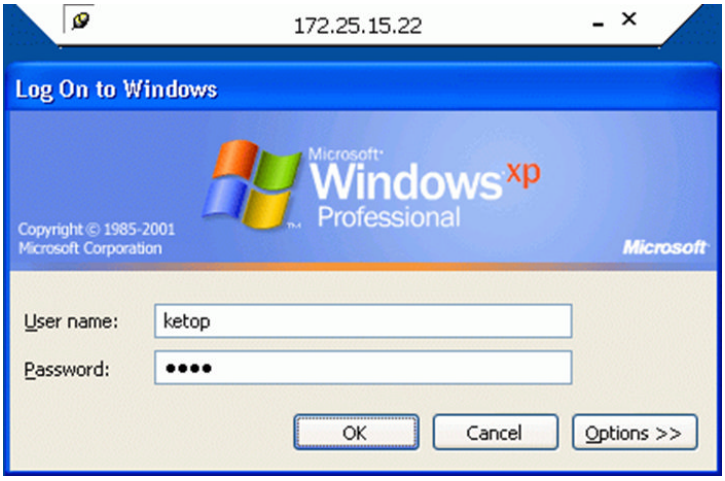
3) Click the button “Connect” to establish connection with the destination computer.



Clicking the “Cancel” button disrupts the connection set up.

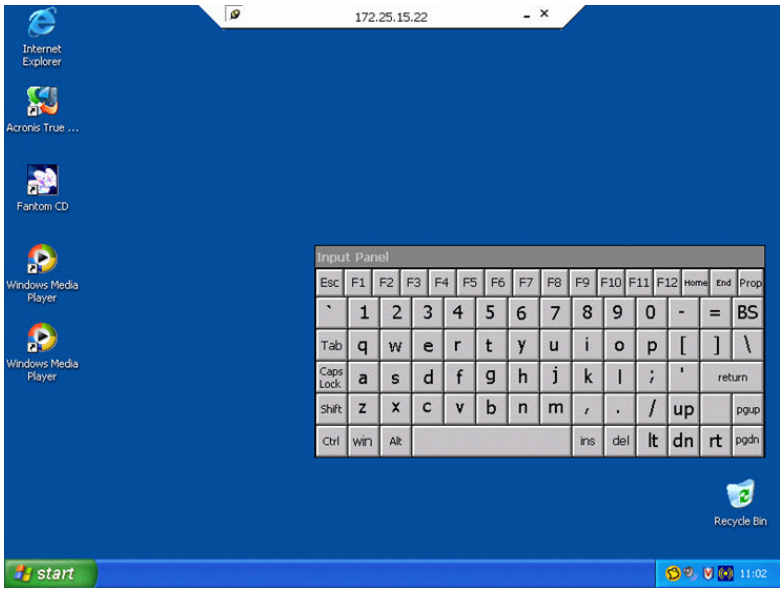
Once the connection has been established, the login window of the destination computer is displayed with a trapezoidal title bar that is treated as an identifier of the RDP-Connection.

KEBA © KEBA 2009



4) Enter the username and the password and confirm by clicking OK.

The Windows screen of the destination computer is displayed once login is successful.

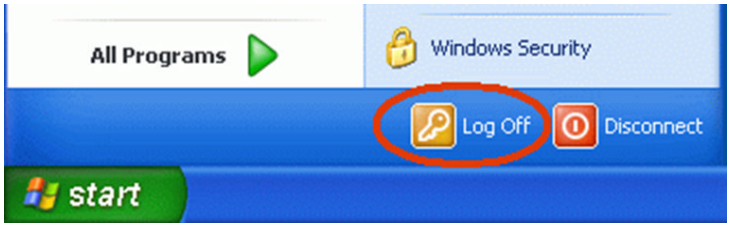


If the trapezoidal title bar shows any errors when being used with certain applications, it can be deactivated when logging in the next time, by simply clicking the symbol at the top left.

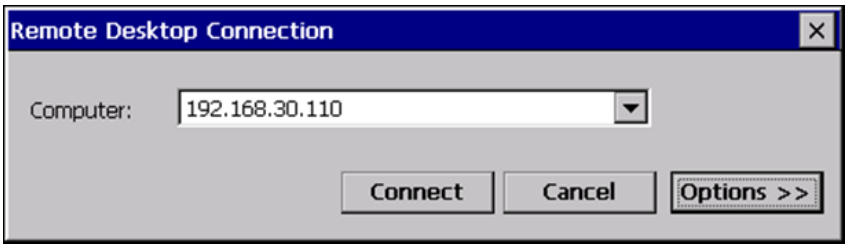
© KEBA 2009

If this symbol is displayed, the title bar automatically disappears after the next login.

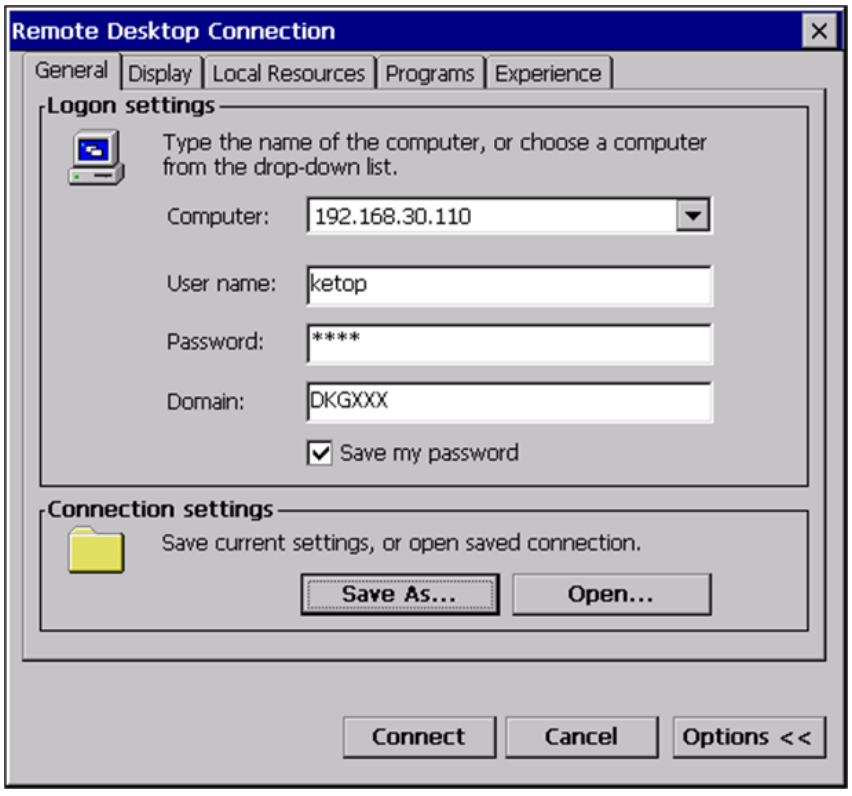
By invoking ***Start*** ▸ ***Log Off***, you can logout of the destination computer.



7.8.3.2 Saving the settings of a RDP-Connection

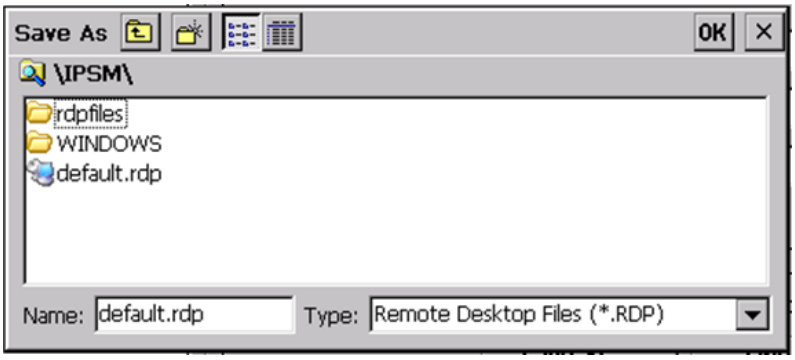


1) Clicking the button “Options >>” on the login window of the RDP-Client displays an expanded window with the current settings.



2) Click the button “Save As….” and save all these settings in a file of the type “rdp”.

KEBA © KEBA 2009



7.8.3.3 Starting the RDP-Connection automatically via an entry in the registry

Connection with the destination compute can be established automatically on starting the KeTop with the help of an entry in the registry under [HKEY_LOCAL_MACHINE\Autostart]. (Also refer to *chapter 7.7 "Program for Starting the Application and KeTop API" on page 62*)

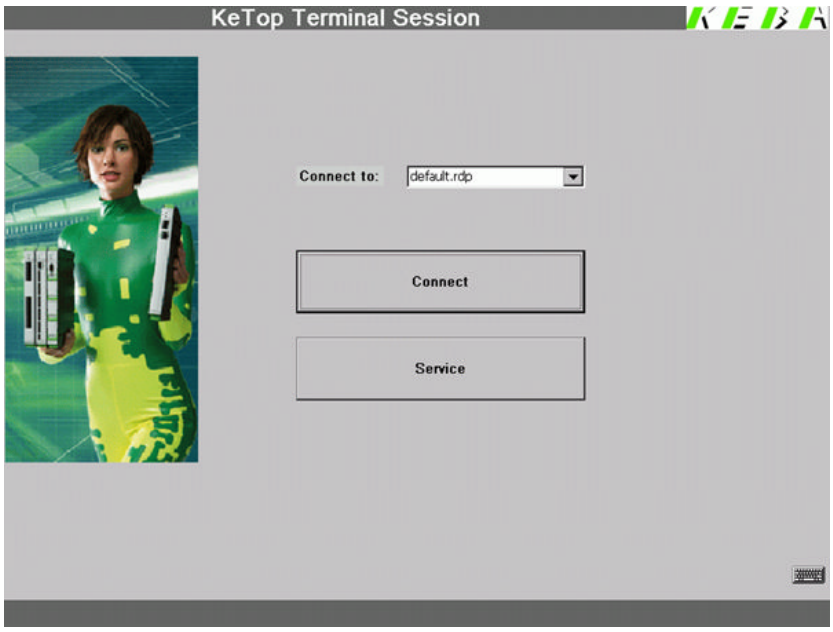
Startx = "\windows\cetsc.exe"

Paramsx = "\ipsm\default.rdp"

While doing so, the precise RDP-settings must be saved in the file “\ipsm\default.rdp”.

7.8.3.4 Starting a RDP-Connection via TSCDialog

KEBA has produced TSCDialog.exe, an upgraded version of the RDP-Client with further enhancements. This program can be used to regulate the operator’s access to Windows CE. Moreover, the login screen can be designed as desired.



The following entry must exist in the registry in order to invoke the TSCDialog.exe when the KeTop is turned on:

© KEBA 2009

HKEY_LOCAL_MACHINE\Autostart\Startx = "\windows\tscdialog.exe"

While doing so, the precise RDP-settings must be saved in the file “\ipsm \rdpfiles\default.rdp”.

To customize the login screen as required, individual elements of the login screen may be replaced by customer-specific elements.

The customization is controlled using the file **\ipsm\rdpfiles\resources \TSCDialog.ini**

- `TakeUserLogo:i:1`
- `ProgTitle:s:title` (Title)
- `LogoFileName:s:logo.bmp` (Logo right top, in place of “KEBA”)
- `ImgFileName:s:bitmap.bmp` (Image to the left, in place of the woman in green)

Likewise, the files “logo.bmp" and "bitmap.bmp" must also be entered in the directory “\ipsm\rdpfiles\resources\".

7.9 KVC - KEBA Virtual Channel

The protocol "KEBA Virtual Channel" (KVC) is used to transmit control and operating element data between a control and one or more KeTop handheld terminals.

The following data can be transmitted via the KVC:

Data	Direction ST ↔ HT	Value range	Size [bytes]	Transmission
Override potentiometer	←	0..127	1	Event in case of modification and upon request of the control
Electronic handwheel	↔	0..65535	2	Event in case of modification, upon request of the control, and as set command for adjusting
Joystick	←	3x -15..15	2	Event in case of 0-Pos and ≠ 0-Pos, then request of control
Lighting for button below display	↔	on flashing off	2	As command from the control and as request from the client to the control.
LEDs on keypad				
Contrast, brightness	↔	0..255	1	As command from the control and as request from the client to the control
Time for screensaver	↔	0..255	1	As command from the control and as request from the client to the control
State of screensaver	←	0..1	1	Event or as request from the client to the control
Background lighting	↔	0..1	1	As command from the control and as request from the client to the control
WriteToFlash	→	-	-	Command
PlaySound	→	0..255	1	Command
KeepAlive	↔	0..65535	2	Command and KeepAliveEvent if parameterized by the server

KEBA © KEBA 2009

The data transmission between the control and the handheld terminals is based on an Ethernet connection (TCP/IP protocol, Listening Port **0xCEBA**). All devices must be identified by their IP address.

Several handheld terminals may be connected to **one** control, but one handheld terminal can only be connected to **one** control. The KVC protocol is an event-driven protocol, i.e. each station can send data at any time without request.

To monitor the functioning of the KeTop in the control, the KVC offers the possibility to use KeepAlive data packages that are periodically sent from the client to the server. The intervals at which the data packages are sent can be set in milliseconds.

Events causing the client to send data:

- Modification of value of override potentiometer
- Modification of handwheel value
- Modification of key status of a key
- The joystick or the space mouse reaches the 0 position.
- The joystick or space mouse leaves the 0 position.
- Data inquiry of server

With each event, the client sends to the server a data package containing the information about the type of event as well as the current data of all operating elements. If the client produces several events one after the other, and the server cannot process all of them at once (e.g. quick rotation of handwheel and simultaneous movement of joystick), the server will send one message containing all events.

7.9.1 Events of Server

By sending a package to the client, the server can influence the status of the LEDs on the client, set the current value of the handwheel, or request the current values (position of joystick, handwheel and override potentiometer, as well as state of keys). The server can also read the current states of the values which can be modified by the server.

7.9.2 Data Transmission

Each of the two socket connections between the client and the server constitutes a channel for the data transmission in each direction. The data structures relevant for the corresponding data direction are described in this chapter.

7.9.2.1 Client → Server

```
typedef enum {
     eKVCJoystickIsZero    0x0001
     eKVCJoystickNotZero   0x0002
     eKVCSpaceMouseIsZero  0x0004
     eKVCSpaceMouseNotZero 0x0008
     eKVCHandWheelChanged  0x0010
     eKVCOverrideChanged   0x0020
     eKVCKeyPressed        0x0040
     eKVCKeyReleased       0x0080
     eKVCLedValue          0x0100
```


© KEBA 2009

```
     eKVCContrast          0x0200
     eKVCBrightness        0x0300
     eKVCVolume            0x0400
     eKVCScreensaverTime   0x0500
     eKVCScreensaverState  0x0600
     eKVCBacklightState    0x0700
     eKVCLed               0x0800
     eKVCJoystickResp      0x0900
     eKVCSpaceMouseResp    0x0A00
     eKVCHandWheelResp     0x0B00
     eKVCOverrideResp      0x0C00
     eKVCAlive             0xFE00
     eKVCClientDisconnect  0xFF00
} TKVCEvent;

typedef struct {
     UINT16 event;
     struct {
          UINT8 overrideVal;
          UINT8 keyVal;
          TKVCJostickData joystickVal;
          SINT16 handWheelVal;
          TKVCSpaceMouseData spaceMouseVal;
     } data;
} TKVCClientData;

typedef enum {
     eKtpKeyboardLedOff   = 1,
     eKtpKeyboardLedOn    = 2,
     eKtpKeyboardLedBlink = 3
} TKtpLedState;

typedef struct {
     char posX;
     char posY;
     char posZ;
} TKVCJostickData;

typedef struct {
     UINT16 posX;
     UINT16 posY;
     UINT16 psoZ;
} TKVCSpaceMouseData;

typedef struct {
     SINT16 absVal;
     SINT16 dynVal;
}TKVCHandWheelData;
```

7.9.2.2 Server → Client

```
typedef enum {
     eKVCSetWheelValue,
     eKVCSetLed
     eKVCSetContrast,
     eKVCSetBrightness,
     eKVCSetVolume,
     eKVCSetScreensaver,
     eKVCGetLed,
     eKVCGetContrast,
     eKVCGetBrightness,
     eKVCGetVolume,
     eKVCGetScreensaverTime,
     eKVCGetJostickValue,
     eKVCGetSpaceMouseValue,
     eKVCGetOverrideValue,
     eKVCGetWheelValue,

     eKVCSwtichBacklight,
     eKVCGetBacklightState,

     eKVCPlaySound,
     eKVCWriteFlash,
     eKVCDisconnect
```


KEBA © KEBA 2009

```
} TKVCCommand;

typedef struct {
     TKVCCommand command;
     SINT16 param;
} TKVCServerData;
```

7.9.3 Example: Interface on Server

On the server side, the KVC protocol is represented by two classes: `CKVCServer` and `CKVCConnection`. An object of the `CKVCServer` class represents the actual server (the "listener") and an object of the `CKVCConnection` class represents a connection to a client.

7.9.3.1 "Server class"

```
class CKVCServer {
public:
   virtual int Init();
   virtual int Exit();
   virtual CKVCConnection* OnClientConnect(SOCKET socket,
                                           sockaddr_in &sockAdr);
   virtual int OnClientDisconnect(CKVCConnection *pConnection,
                                  TDisconInfo info);
   POSITION ConnectionListHeadPos();
   CKVCConnection* ConnectionListGetNext(POSITION pos);
   int ConnectionListGetCount();
};

int Init();
Initalizes the server and opens the port 0xCEBA for incoming connections.

int Exit();
Finishes all connections and closes the port 0xCEBA.
```

- `CKVCConnection* OnClientConnect(SOCKET socket, sockaddr_in &sockAdr);`

  This method is always called when a teach pendant establishes a connection to the control. The parameters `socket` and `sockAdr` specify the connection parameters of the teach pendant. This function must return a pointer to an object of the class `CKVCConnection`. A return value of 0 indicates that the control rejects the logon of the teach pendant.

- `int OnClientDisconnect(CKVCConnection *pConnection, TDisconInfo info);`

  This method will be called if the server cannot reach the client any more. The cause of the logoff is specified in `info`.

- `POSITION ConnectionListHeadPos();`

  This method returns the position of the first entry in the OpenConnection list.

- `CKVCConnection* ConnectionListGetNext(POSITION pos);`

  This method returns a pointer to the ConnectionObject that is stored on the position pos in the OpenConnection list.

- `int ConnectionListGetCount();`

  This method returns the number of connections that are stored in the OpenConnection list.

© KEBA 2009

7.9.3.2 Connections

For details about the LED numbering (ledNr) needed for the following functions, refer to *"Numbering of LEDs" on page 41*.

```
class CKVCConnection {
private:
   char *pIpAdr;
public:
   virtual int Init(CKVCServer *pServer, SOCKET socket,
                    SOCKADDR_IN &socketAdr,Tpriority threadPriority);
   virtual int Exit();
   virtual int OnOverrideChange(SINT16 val);
   virtual int OnWheelChange(SINT16 wheelAbsVal);
   virtual int OnKeyboardEvent(TKVCEvent keyEvent, int keyNum);
   virtual int OnJoystickEvent(TKVCEvent event, TKVCJoystickData *pJData);
   virtual int OnSpaceMouseEvent(TKVCEvent event,
                                 TKVCSpaceMouseData *pSMData);
   virtual int OnDisconnect(int val);
   virtual int OnAlive(void);

   virtual int GetWheelVal(TKVCHandWheelData &hwData);
   virutal int GetOverrideVal(SINT16 &overrideVal);
   virtual int GetJoystickPos(TKVCJoystickData &jData);
   virtual int GetSpaceMousePos(TKVCSpaceMouseData &smData);
   virtual int GetLedState(UINT8 ledNum,UINT8 &state);
   virtual int GetContrast(UINT8 &contrast);
   virtual int GetBrightness(UINT8 &brightness);
   virtual int GetVolume(UINT8 &volume);
   virutal int GetScreensaverTime(UINT16 &time);
   virtual int GetScreensaverState(UINT8 &state);

   virtual int SetWheelVal(SINT16 val);
   virtual int SetLed(UINT8 ledNum, TKVCLedMode mode);
   virtual int SetContrast(UINT8 contrast);
   virtual int SetBrightness(UINT8 brightness);
   virtual int SetVolume(UINT8 volume);
   virtual int SetScreenSaver(UINT16 screenSaverTime);
   virtual int SwitchBacklight(UINT8 backlightOnOff);

   virtual int WriteToFlash();
   virtual int PlaySound(UINT16 soundNr);
};
```

The methods `OnOverrideChange`, `OnWheelChange`, `OnKeyboardEvent`, `OnJoystickEvent` and `OnSpacemouseEvent` will be called if an event has occurred at the corresponding operating element on the client.

- `int CKVCConnection::OnOverrideChange(SINT16 val);`

  This method will be called if the value of the override potentiometer has changed on the client. The current value is specified in the parameter `val`.

- `int CKVCConnection::OnWheelChange(SINT16 wheelAbsVal);`

  The method `OnWheelChange` will be called if the value of the handwheel has changed. The current value is transferred as an absolute value in the parameter `wheelAbsVal`.

- `virtual int OnKeyboardEvent(TKVCEvent keyEvent, int keyNum);`

  The method `OnKeypadEvent` will be called if a key has been pressed/released. The key number is specified in `keyNum`, the state of the key (make, break) in `keyEvent`.

KEBA © KEBA 2009

- `int CKVCConnection::OnJoystickEvent(TKVCEvent event, TKVCJoystickData *pJData);`

  The method `OnJoystickEvent` is called when the joystick is moved from the 0 position and reaches the 0 position. The current position is transferred in the parameter `event`, and the current values in the parameter `pJData`.

- `int CKVCConnection::OnSpacemouseEvent(TKVCEvent event, TKVCSpaceMouseData *pSMData);`

  The method `OnSpacemouseEvent` is called when the space mouse is moved from the 0 position and reaches the 0 position. The current position is transferred in the parameter `event`, and the current values in the parameter `pSMData`.

- `int CKVCConnection::OnDisconnect(int val);`

  The method `OnDisconnect` will be called if the client terminates the connection with the disconnect message.

- `int CKVCConnection::OnAliveMsg();`

  The mehtod `OnAliveMsg` will be called when the client receives a KeepAliveMessage.

- `int CKVCConnection::GetWheelVal(TKVCHandWheelData &hwData);`

  The method `GetWheelVal` returns the current position value of the wheel in `hwData.absVal`, and the modification value since the last call in `hwData.dynVal`.

- `int CKVCConnection::GetOverrideValue(SINT16 &overrideVal);`

  The method `GetOverrideValue` returns the current value of the override potentiometers in the variable `overrideVal`.

- `int CKVCConnection::GetJoystickPos(TKVCJoystickData &jData);`

  The method `GetJoystickPos` returns the current joystick position in the variable `jData`.

- `int CKVCConnection::GetSpaceMousePos(TKVCSpaceMouseData &smData);`

  The method `GetSpaceMousePos` returns the current space mouse position in the variable `smData`.

- `int CKVCConnection::GetLedState(UINT8 ledNr , UINT8 &state);`

  The method `GetLedState` is used to request the current state of the LED transferred in `ledNr`. The result is returned in `state`.

- `int CKVCConnection::GetContrast(UINT8 &contrast);`

  The method `GetContrast` returns the current value of the contrast setting in the variable `contrast`.

© KEBA 2009

- `int CKVCConnection::GetBrightness(UINT8 &brightness);`

  The method `GetBrightness` returns the current value of the brightness setting in the variable `brightness`.

- `int CKVCConnection::GetVolume(UINT8 &volume);`

  The method `GetVolume` returns the current value of the volume setting in the variable `volume`.

- `int CKVCConnection::GetScreensaverTime(UINT16 &screensaverTime);`

  The method `GetScreensaverTime` returns the current value of the screensaver setting in the variable `screensaverTime`.

- `int CKVCConnection::GetScreensaverState(UINT8 &state);`

  The method `GetScreensaverState` returns the current state of the screensaver in the variable `state`.

- `int CKVCConnection::GetBacklightState(UINT8 &state);`

  The method `GetBacklightState` returns the current state of the background lighting in the variable `state`.

- `int CKVCConnection::SetWheel(SINT16 value);`

  This method sets the value of the handwheel to the value specified in `value` and returns the last value. This value is the initial value for the absolute value returned by `OnWheelChange`.

- `int CKVCConnection::SetLed(UINT8 ledNum, TKVCLedeMode mode);`

  Calling the method `SetLed` sets the LED defined in `ledNum` to the mode transferred in `mode`.

- `int CKVCConnection::SetContrast(UINT8 contrast);`

  Calling the method `SetContrast` changes the value of the contrast setting on the client.

- `int CKVCConnection::SetBrightness(UINT8 brightness);`

  Calling the method `SetBrightness` changes the value of the brightness setting on the client.

- `int CKVCConnection::SetVolume(UINT8 volume);`

  Calling the method `SetVolume` changes the value of the volume setting on the client.

- `int CKVCConnection::SetScreensaver(UINT16 screensaverTime);`

  Calling the method `SetScreensaver` changes the response time of the screensaver on the client.

- `int CKVCConnection::SwitchBacklight(UINT8 backlightOnOff);`

KEBA © KEBA 2009

Calling the method SwitchBacklight switches on and off the background lighting on the client (backlightOnOff = 1 / backlightOnOff = 0).

- int CKVCConnection::WriteToFlash();

  Calling the method WriteToFlash saves the contents of the Client Windows Registry in the flash memory.

- int CKVCConnection::PlaySound(UINT16 soundNr);

  Calling the method PlaySound starts the reproduction of the sound with the number transferred in soundNr.

- sockaddr_in GetSocketAdr();

  The method GetSocketAdr returns the features of the connection.

- SOCKET GetSocket();

  The method GetSocket returns the current socket of the connection with the client.

7.9.3.3 Server Implementation

The base of the server are the two classes CKVCServer and CKVCConnection. The class CKVCServer establishes and manages the connections. The class CKVCConnection constitutes the actual connection.

To correctly implement a server, a derivation of the class CKVCServer is needed.

```
class CKVCTestServer: public CKVCServer{
public:
   CKVCTestServer();
   virtual ~CKVCTestServer();

   CKVCConnection* OnClientConnect(SOCKET socket,
                                   sockaddr_in &sockAdr);
   int OnClientDisconnect(CKVCConnection *pConnection,
                          TKVCDisconInfo info);
};
```

In this class, the method OnClientConnect must be overwritten. In this method, a CKVCConnection object must be created and initialized.

```
CKVCConnection* CKVCTestServer::OnClientConnect(SOCKET socket,
 sockaddr_in &sockAdr){
   CKVCTestConnection *pConnect = 0;
   ... pConnect = new CKVCTestConnection();
   if (pConnect != 0){
      pConnect->Init(this, socket, sockAdr);
   }
   ...
   return pConnect;
}
```

The method OnClientDisconnect can be overwritten. But it must be guaranteed that the method CKVCServer::OnClientDisconnect is called in this derivation.

```
int CKVCTestServer::OnClientDisconnect(CKVCConnection
                                       *pConnection,
                                       TKVCDisconInfo info){
   ...
```


© KEBA 2009

```
   return CKVCServer::OnClientDisconnect(pConnection, info);
}
```

IIn the derivation of the class `CKVCConnection`, only the Event and Change method must be derived. The Get methods can be derived, but it must be guaranteed that the method of the base class is called before the data are used.

```
class CKVCTestConnection: public CKVCConnection{
public:
   CKVCTestConnection();
   virtual ~CKVCTestConnection();

   virtual int OnOverrideChange  (SINT16 val);
   virtual int OnWheelChange     (SINT16 wheelAbsVal);
   virtual int OnKeyboardEvent   (TKVCEvent keyEvent, UINT8 keyNum);
   virtual int OnJoystickEvent   (TKVCEvent event,
                                  TKVCJoystickData *pJData);
   virtual int OnSpaceMouseEvent (TKVCEvent event,
                                  TKVCSpaceMouseData *pSMData);
   virtual int OnAliveMsg        ();
   virtual int OnDisconnect      ();
   virtual int GetWheelVal       (TKVCHandWheelData &hwData);
   virtual int GetOverrideVal    (SINT8 &overrideVal);
   virtual int GetJoystickPos    (TKVCJoystickData &jData);
   virtual int GetSpaceMousePos  (TKVCSpaceMouseData &smData);
   virtual int GetLedState(UINT8 ledNum, UINT8 &state);
   virtual int GetContrast       (UINT8 &contrast);
   virtual int GetBrightness     (UINT8 &brightness);
   virtual int GetVolume         (UINT8 &volume);
   virtual int GetScreensaverTime(UINT16 &screeTime);
   virtual int GetScreensaverState(UINT8 &state);
   virtual int GetBacklightState (UINT8 &state);
};

int CKVCTestConnection::OnOverrideChange  (SINT16 val){
   cout << "OnOverrideChange: " << (int)val << endl << flush;
   return true;
}
int CKVCTestConnection::GetOverrideVal    (SINT8 &overrideVal){
   CKVCConnection::GetOverrideVal(overrideVal);
   cout << "GetOverrideVal: " << (int)overrideVal << endl << flush;
   return true;
}
```

7.10 Remote Software ActiveSync

This software is used as a debug interface and to adjust and transmit data from and to a PC.

The remote software ActiveSync is a product by Microsoft and can be downloaded free of charge from the following download address:

http://www.microsoft.com/windowsmobile/activesync/activesync42.mspx

7.10.1 Data connection via RS-232-C debug interface

The data connection from the KeTop to the PC is established as follows:

1) Remove the cover of the cable entrance area on the KeTop.
2) Plug in the Download Cable KeTop XD 040 (KeTop and PC)
3) Start the ActiveSync software on the PC

   a) select ***File*** ▸ ***Delete Partnership...***

KEBA © KEBA 2009

b) deactivate ***Allow serial cable or ...*** → <OK>

c) activate ***Allow serial cable or ...*** → <OK>

4) Start the ActiveSync-Software on the KeTop: ***Start*** ▸ ***Programs*** ▸ ***Communication*** ▸ ***Active Sync***
5) At the PC: Connect KeTop as a "Guest' (Set ***Up a Partnership*** → ***No***).

Now the data connection between the KeTop and the PC is established. In case of communication problems, check the following conditions:

- Max. time delay between step 3c) and step 4. = 30s.
- For further attempts repeat steps 3. to 5.
- The ActiveSync software must be started manually. (Plugging in the connection cable does not start ActiveSync!)

The factory-set baudrate for the remote connection is 115 kBaud. In case of communication problems the baudrate can be reduced. The baudrate can be changed as follows:

1) ***Start*** ▸ ***Programs*** ▸ ***Communication*** ▸ ***Remote Networking***
2) select "com1_115k"
3) ***File*** ▸ ***Properties***
4) ***SP1 on COM1:*** ▸ ***Configure*** ▸ ***Port Setttings***
5) Close all Windows with <OK>

7.10.2 Data connection via USB client

The data connection from the KeTop to the PC is established as follows:

1) Remove the cover of the cable entrance area on the KeTop.
2) Start the ActiveSync software on the PC

   a) delete existing partnerships (***File*** ▸ ***Delete Partnership...***)

   b) activate USB connection (***Allow USB connections*** → <OK>)
3) Connect USB cable (Mini-B) to KeTop and PC. When the KeTop was recognized as USB device, the connection will be established automatically.
4) At the PC: Connect KeTop as a "Guest' (Set ***Up a Partnership*** → ***No***).

The ActiveSync software at KeTop starts automatically when using the USB connection.

© KEBA 2009

8 KeTop - Specific Operating Instructions

This chapter describes the KeTop-specific settings and the differences to standard Windows CE devices.

Information

The date and the time are not stored in the KeTop and, if needed, must be set anew after turning off/on. The date and the time may be very important for the log data for example.

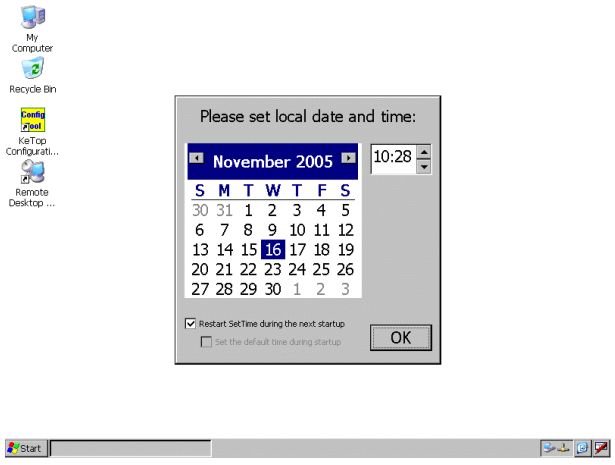
Information

At settings that have not been made with the ConfigTool, the modifications must be saved as follows: ***Start ▸ Programs ▸ KeTop ▸ Registry Backup*** *(or in the explorer with the command "\windows\RegistryBackup.exe")*

8.1 Setting of Date and Time

During start-up the KeTop shows automatically the window for setting date and time.

The real time clock is not puffered with a battery. So, if you use real time clock it must be set during each start up.


My Computer
Recycle Bin
KeTop Configurati...
Remote Desktop ...
Please set local date and time:
November 2005
10:28
S M T W T F S
30 31 1 2 3 4 5
6 7 8 9 10 11 12
13 14 15 16 17 18 19
20 21 22 23 24 25 26
27 28 29 30 1 2 3
Restart SetTime during the next startup
Set the default time during startup
OK
Start

The automatically pop up of this window can be disabled by deactivatig the checkbox "Restart Settime during next startup". In this case date and time get random values.

If the other checkbox "Set the default time during startup" is activated, the KeTop uses default values. (date and time when the image was ceated.) In both cases the settings must be saved in the registry. (***Start ▸ Programs ▸ KeTop ▸ Registry Backup***).

KEBA © KEBA 2009

8.2 KeTop Configuration Tool (ConfigTool)

The ConfigTool is used to calibrate the operating elements, to control the functionality of the operating elements and to set start-up functions.

To activate the tool, select the following item:

Start ▸ Programs ▸ KeTop ▸ KeTop Configuration Tool (or by double-clicking on the file „Configuration_Tool.exe“ in the Windows directory).

Information

The appearance of the Config tool depends on the operating elements installed in KeTop (the menus for override potentiometer, joystick and handwheel are only displayed when the operating elements are installed in the device).

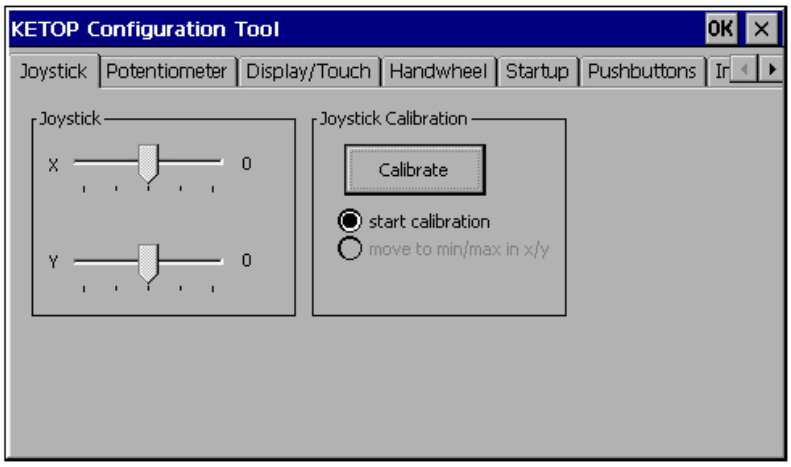
After carrying out modifications on the configuration and quitting the program, you can save all modifications in the registry. A window with the following message and options appears:

Data has changed! Do you want to write the registry to the flash? Yes/No

With "No", the settings will not be stored therefore. They will get lost when the KeTop is turned off.

"Yes" saves the calibration in the flash. The settings are preserved after a restart of the device. The device is blocked during the saving procedure (takes approx. 10 s).

8.2.1 Calibration of Joystick

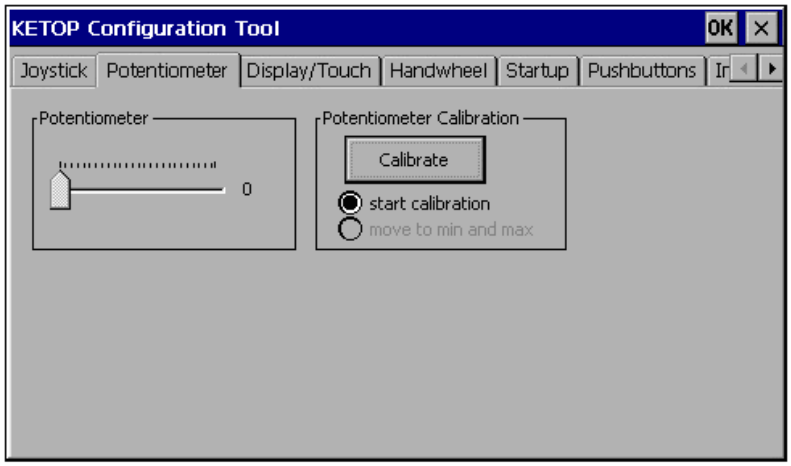


A number is displayed next to the slide bar. During calibration, this number specifies the current value of the ADC (value range: 0..1024) and only controls the function. After calibration, the number specifies the current value of the joystick (value range: -15.. 0..+15 for each joystick axis).

This value is also the value the KeTop API function `KtpGetJoystickPos` supplies to the application.

© KEBA 2009

8.2.2 Calibration of Potentiometer

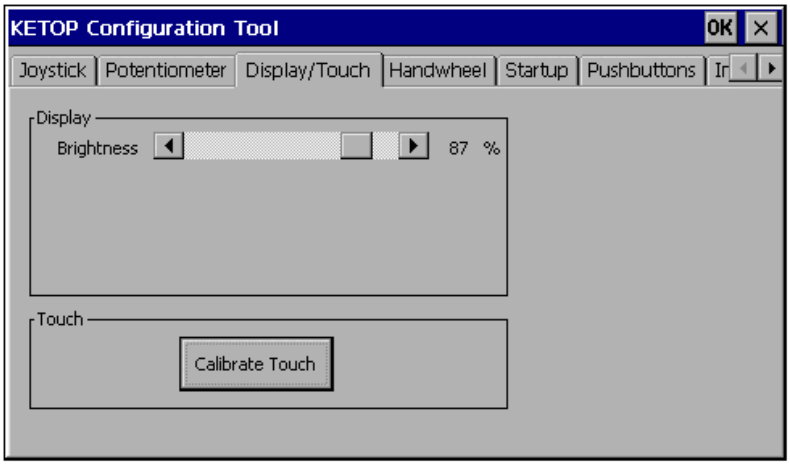


A number is displayed next to the slide bar. During calibration, this number specifies the current value of the ADC and only controls the function. After calibration, the number specifies the current value of the potentiometer (value range: 0..127).

This value is also the value the KeTop API function `KtpGetOverridePoti` supplies to the application.

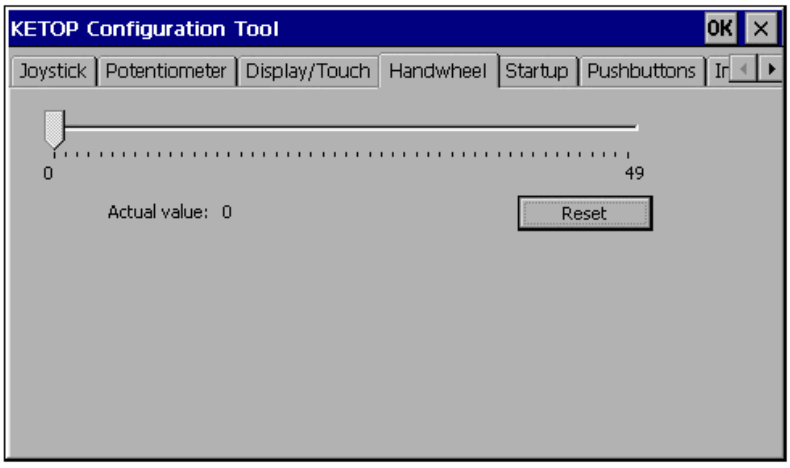
8.2.3 Display and Touch Screen Settings

In this window, the brightness and the contrast for the display are set. Furthermore you can also calibrate the touch screen in this window.



KEBA © KEBA 2009

8.2.4 Setting the Handwheel to Zero

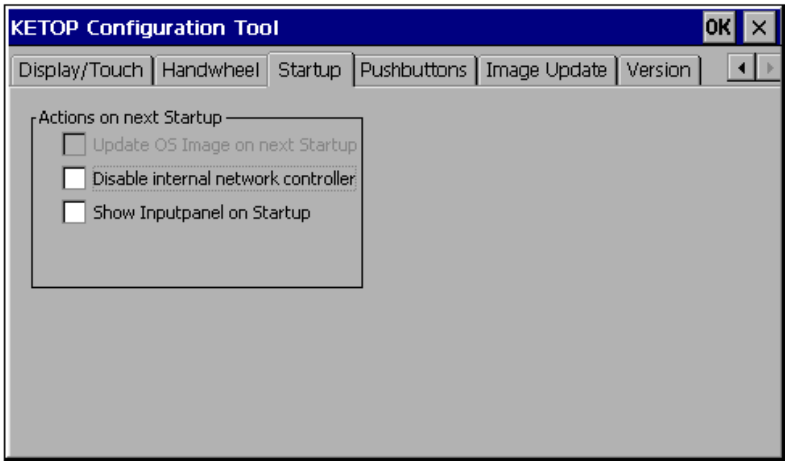


The handwheel outputs a 16-bit value which can be processed in the customer application as needed (e.g.: 0-65535, +/-32767, ...).

In the dialog box, the value from 0 to 65535 is displayed. When the device is turned on, the value of the handwheel will be set to 0.

If the key "Reset" is pressed, the current value of the handwheel will be replaced by the start value (0).

8.2.5 Actions on next Startup



In this window, you can determine actions that are executed after a restart of the KeTop.

- **Update OS Image on next Startup** (not available yet):

  If you select this item, an OS(Operating System) image will automatically be loaded from the BOOTP Server via the network next time the KeTop is started.

© KEBA 2009

Information

In this case, the Ethernet connection must have been established, the BOOTP Server must be correctly configured and an OS image file must be available on the server.

- **Disable internal network controller**:

  If you select this item, the internal Ethernanet interface "CELAN1: Onboard Ethernet" (see ***Start*** ▸ ***Settings*** ▸ ***Control Panel*** ▸ ***Network*** ▸ ***Network Configuration***) will be turned off at next startup.

Information

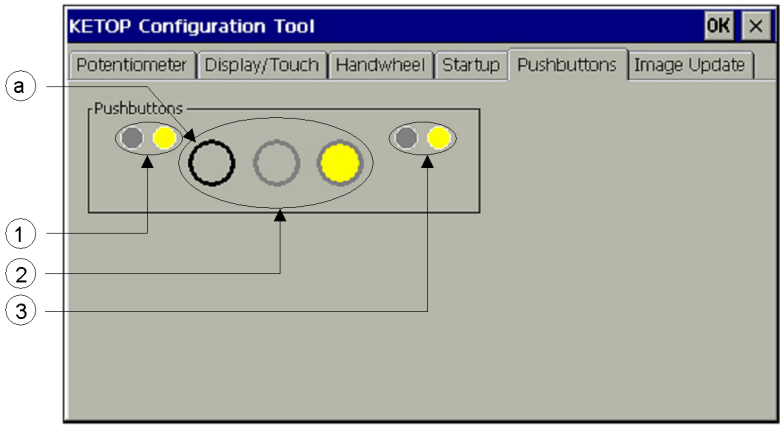
This function is necessary if - for example - an Ethernet interface has to be installed at the PCMCIA slot (only for KeTop T100).

The Ethernet controller has to be configured within the Control panel.

- **Show Inputpanel on Startup**:

  If you select this item, the softkeyboard will be launched at every startup.

8.2.6 Control of Buttons (Pushbuttons)



1 ... Symbols for the left LEDs of the membrane keypad (if available)	2 ... Symbols for operating elements
3 ... Symbols for the right LEDs of the membrane keypad (if available)	a ... The black ring signalizes the actuation of an operating element

This toolbox enables a simple functional control of the buttons of the KeTop.

By clicking on one of the three symbols for operating elements (2), the corresponding LEDs of the operating elements can be switched on, off or to flashing. The first click switches the LED to flashing, the second click switches the LED on, and the third click switches the LED off again.

The same applies to the LEDs of the membrane keypad (1 and 3).

The actuation of an operating element is signalized by a black ring (a). This ring is grey if the operating element is not actuated.

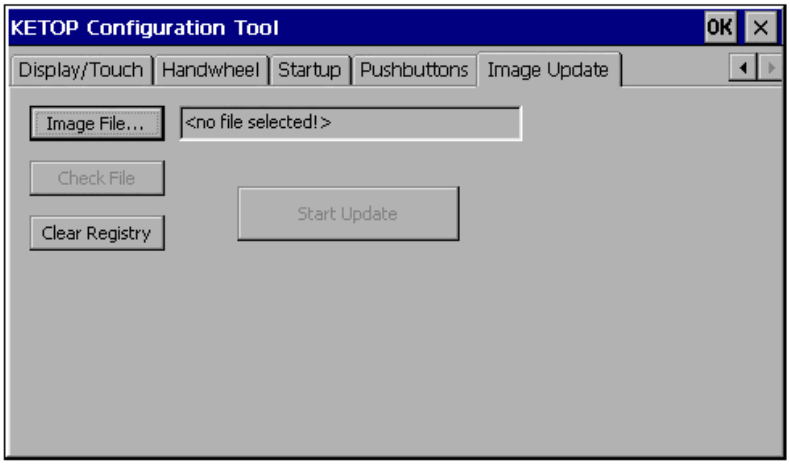
KEBA © KEBA 2009

8.2.7 Loading an Image File

This toolbox enables loading an image file into the KeTop.

Information

- *The image file may be copied to every directory excepting to directory \IPSM.*
- *Before each image update execute "Check file" necessarily.*



- **Image File**

  Clicking this button enables you to select a new WinCE image file in the file selection dialog.

Information

In the event of an image update, the registry will be deleted and the KeTop rebooted automatically. Following that, the KeTop reboots with the factory settings.

- **Check File**

  The selected file can be checked for validity. "Check File" will only be active if a valid image file has been selected.

- **Start Update**

  This button starts the update. The progress status is displayed in the bar below. "Start Update" will only be active if the selected image file has been successfully checked for validity (with "Check File").

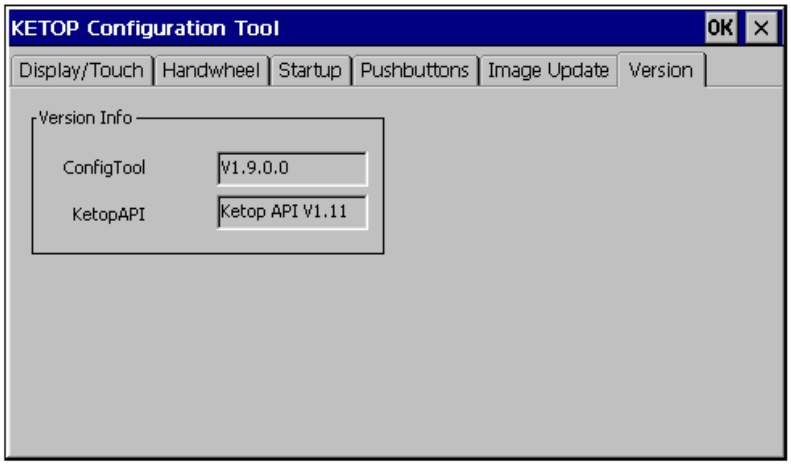
- **Clear Registry**

  This item clears the registry and automatically reboots the KeTop. Following that, the KeTop reboots with the factory settings, and all settings (touch screen, joystick and override potentiometer, system control,...) must be stored anew.

© KEBA 2009

8.2.8 Version Info

This windows shows the actual verison of the ConfigTool and KetopAPI of the KeTop.



8.2.9 Checking the Operating and Control Elements

For checking the functionality of the operating and control elements of the KeTop, the KeTop provides the software „Systemcheck“. This software is contained in the start menu and can be operated intuitively. It is called as follows:

Start ▸ Programs ▸ KeTop ▸ "System Check"

Provided they are exist on the device, the following operating and control elements can be checked:

- Override potentiometer
- Electronic handwheel
- Joystick
- Status LEDs
- Membrane keyboard
- Touch screen
- Display
- Illuminated push button
- Key switch
- Selector switch
- PC card interface (slot), if existing.

The following control elements CANNOT be checked since their internal evaluation via the electronics is not provided:

- Emergency stop switch
- Enabling switches

KEBA © KEBA 2009

8.3 Installation of Programs

Programs can be only installed in the IPSM (Intel Persistent Storage Manager) directory. Since only this directory is stored in the flash, data installed in another way will get lost after turning off the KeTop.

Installation data entered in the registry can be saved with the command "\Windwos\RegistryBackup.exe".

Information

System files, which are copied to the directory \windows while installation, do not remain durably stored. For this reason these files must be copied manually into the directory \IPSM\windows (if necessary, this directory must be created by the user). With a restart of Windows CE these files are copied automatically into the directory \windows. So, these files are again available for the operating system and are again present also after a restart.

8.4 Saving Files

Files must be saved in the IPSM directory. The contents of other directories are not saved when the device is turned off.

8.5 Transfering Files

8.5.1 Transfer via external storage device (PC-card, CF-card, USB-Stick)

For further information on suitable storage devices please refer to *chapter 4.10 "PC Card Slot for PC Cards I, II, III" on page 34*.

1) Insert the external storage device into a suitable PC.
2) Copy the required files to the external storage device.
3) Insert the external storage device into the KeTop.
4) Copy the required files from "\storage card" or “\hard disk” to "\ipsm".

8.5.2 Transfer via network connection by SMB acces from PC to KeTop

This kind of SMB access is only possible with Windows XP Professional and some Versions of Windows 2000.

For general information see *chapter 4.7 "Ethernet" on page 31*.

The KeTop must have a valid Ethernet address.

In case there is no DHCP-server in the network, the IP-address can be set via ***Start*** ▸ ***Settings*** ▸ ***Control Panel*** ▸ ***Network and Dial-up Connections*** ▸ ***CELAN1...*** ▸ ***Properties...***.

To save the IP-address go to ***Start*** ▸ ***Programs*** ▸ ***KETOP*** ▸ ***Registry Backup*** and restart the KeTop. (The Ethernet-connection can be checked with "Ping".)

© KEBA 2009

Then enter the IP-address of the KeTop in the address line of the Windows Explorer at the PC. (e.g.: \\192.168.30.107).

The PC now has full access to the directory structure at the KeTop so that all required files can be copied from the PC to "\ipsm" at the KeTop.

8.5.3 Transfer via network connection by access from KeTop to the PC

For general information see *chapter 4.7 "Ethernet" on page 31*.

The KeTop must have a valid Ethernet address.

In case there is no DHCP-server in the network, the IP-address can be set via ***Start*** ▸ ***Settings*** ▸ ***Control Panel*** ▸ ***Network and Dial-up Connections*** ▸ ***CELAN1...*** ▸ ***Properties...***.

To save the IP-address go to ***Start*** ▸ ***Programs*** ▸ ***KETOP*** ▸ ***Registry Back-up*** and restart the KeTop. (The Ethernet-connection can be checked with "Ping".)

After start-up of the KeTop start the Windows Explorer at the KeTop. (***Start*** ▸ ***Programs*** ▸ ***Windows Explorer***)

The shared directory of the PC can new be addressed in the address line of the Windows Explorer at KeTop with "\\<pcname>\<share name>". (e.g.: \ \tkg007\temp)

The directory at the PC must be shared and a user with the necessary rights to access must exist.

The files can now be copied from the PC to "\ipsm" at the KeTop.

8.5.4 Transfer via ActiveSync

Therefore see *chapter 7.10 "Remote Software ActiveSync" on page 78*.

KEBA © KEBA 2009

9 Options

This chapter describes the options the KeTop is available with.

9.1 Override Potentiometer

If available, the override potentiometer in the KeTop is evaluated by the software and can be read via the KeTop-API using a program.

The override potentiometer can be used for example for setting the number of spindle revolutions and the forward feed on machine tools.

- Resolution: 0 - 27, linear

9.2 Electronic Handwheel

If available, the electronic handwheel in the KeTop is evaluated by the software and can be read via the KeTop-API using a program.

50 pulses are counted per revolution. Turning the handwheel clockwise increments the count, turning the handwheel counter-clockwise decrements the count (0-65535, 16-bit value).

Main features

- 50 lock-in positions / revolution
- 1 pulse / lock-in position

Information

If the KeTop falls to ground, control the position of the handwheel knob. If necessary press down the knob until it snaps in.

9.3 Illuminated Push-Button

If available, the illuminated push-buttons in the KeTop are evaluated by the software and can be read via the KeTop-API using a program.

The illuminated push-buttons are available as "momentary" type or as "maintaining" type.

9.4 Key Switch

If available, the key switch is evaluated by the software in the KeTop and can be read via the KeTop-API using a program.

The key switch is available with 3 positions.

© KEBA 2009

9.5 Selector Switch

If available, the selector switch is evaluated by the software in the KeTop and can be read via the KeTop-API using a program.

The selector switch is available with 3 positions labeled "I-0-II".

9.6 Joystick

If available, the 2-axis joystick in the KeTop is evaluated by the software and can be read via the KeTop-API using a program.

To avoid that the joystick is damaged when the device falls to ground, a short joystick is used. The joystick enables moving robot axes for example.

- Value range: -15 to +15 per axis (31 increments)

In the KeTop T100 there is only space for the optionally 3-axis joystick **or** a flash card slot.

KEBA © KEBA 2009

10 Accessories

10.1 Wall Bracket without Height Adjustment plate KeTop WB090, WB095, WB120

The powder-coated black wall bracket is used for stationary operation or storage of the KeTop.

Three types of wall brackets without height adjustment plate are available:

KeTop WB090	KeTop WB095	KeTop WB120
Wall bracket without cable suspension	Wall bracket with cable suspension	Wall bracket with cable suspension and solenoids

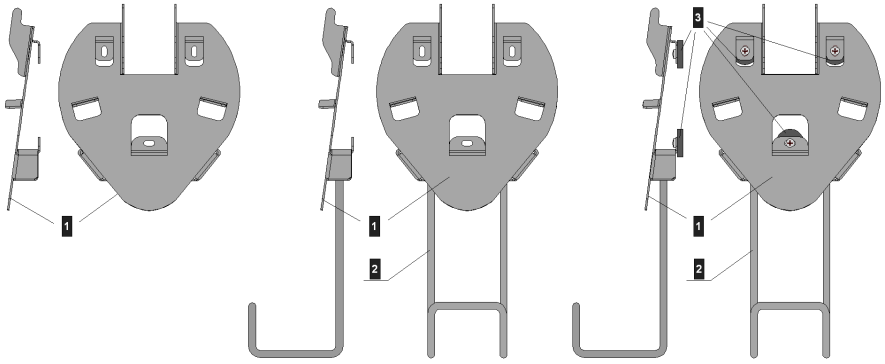


Fig.10-1: Wall brackets KeTop WB090, WB095 and WB120

1 ... Carrier	2 ... Cable suspension
3 ... solenoids	

© KEBA 2009

10.1.1 10.1.1 Dimensions (mm)

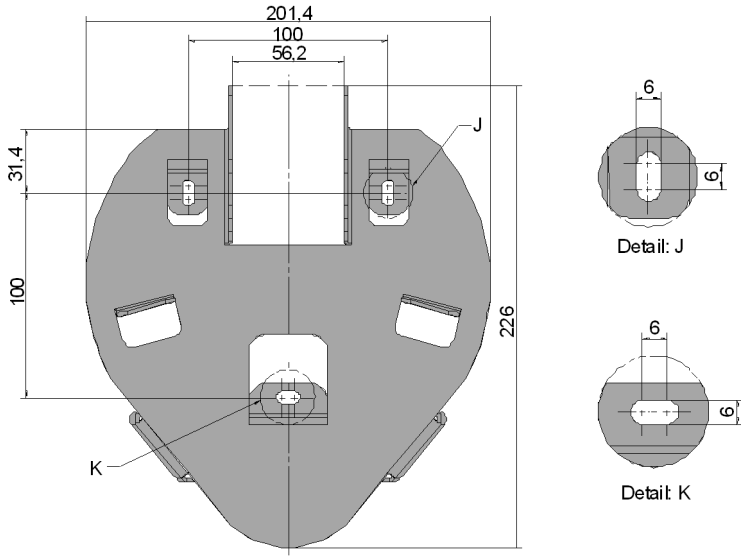


Fig.10-2: Wall bracket KeTop WB090, front view

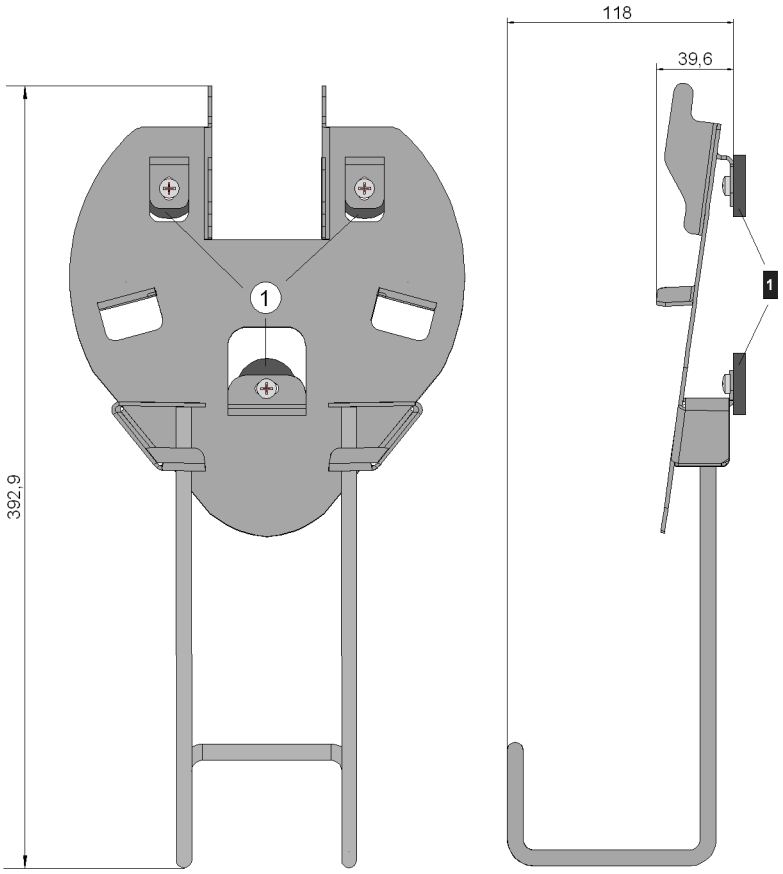


Fig.10-3: Wall brackets KeTop WB095 / WB120, rear and side view

1 ... Solenoids (only valid for KeTop WB120)

KEBA © KEBA 2009

10.2 Wall Bracket with Height Adjustment plate KeTop WB 110

The powder-coated black wall bracket is used for stationary operation or storage of the KeTop.

The carrier is adjustable in 8 positions over a height of 320 mm (12.6 in). Take care to hang up the carrier in all 4 points in the height adjustment plate. The cable suspension must be mounted on the carrier using the screws delivered with the device.

KeTop WB 110
Wall bracket with cable suspension

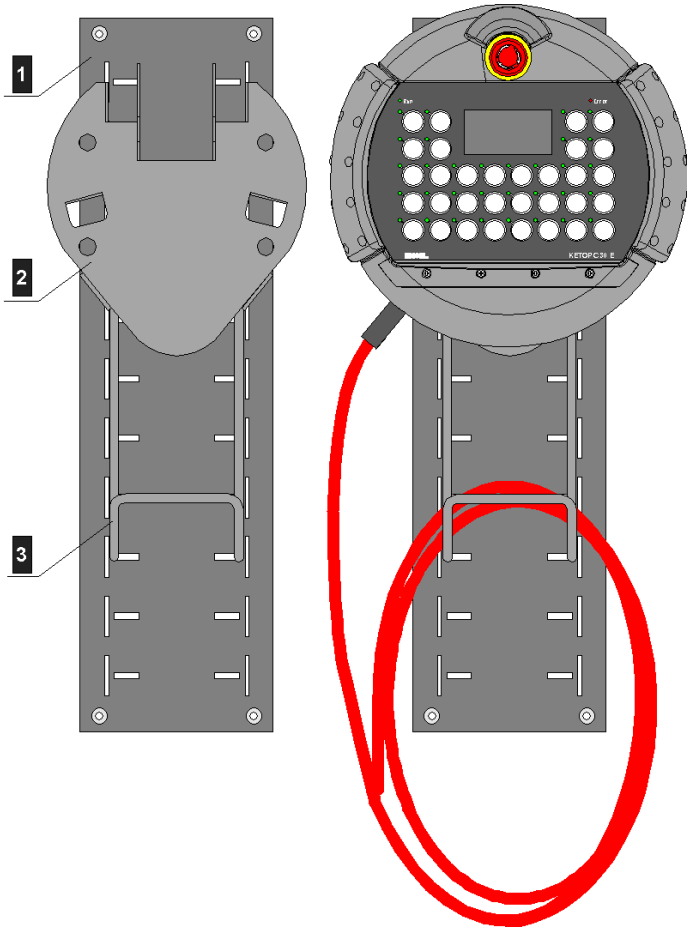


Fig.10-4: Wall bracket KeTop WB 110 with and without KeTop

1 ... Height adjustment plate	2 ... Carrier
3 ... Cable suspension	

10.2.1 Height adjustment plate

For mounting the height adjustment plate, use suitable screws (not part of delivery).

© KEBA 2009

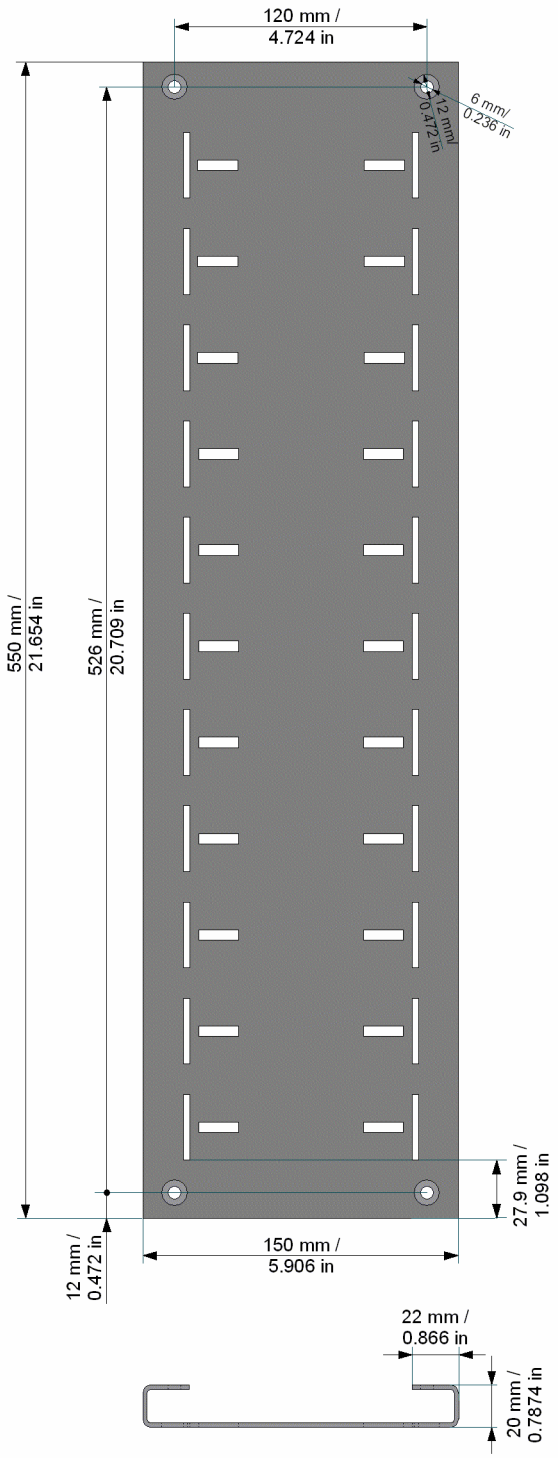


Fig.10-5: Height adjustment plate for wall bracket WB 110

10.3 Junction Box JB 001

This chapter describes the junction box JB 001 which is used to connect a KeTop to a Kemro PLC via Ethernet, CAN, RS-422-A and RS-232-C.

KEBA © KEBA 2009

10.3.1 Device description

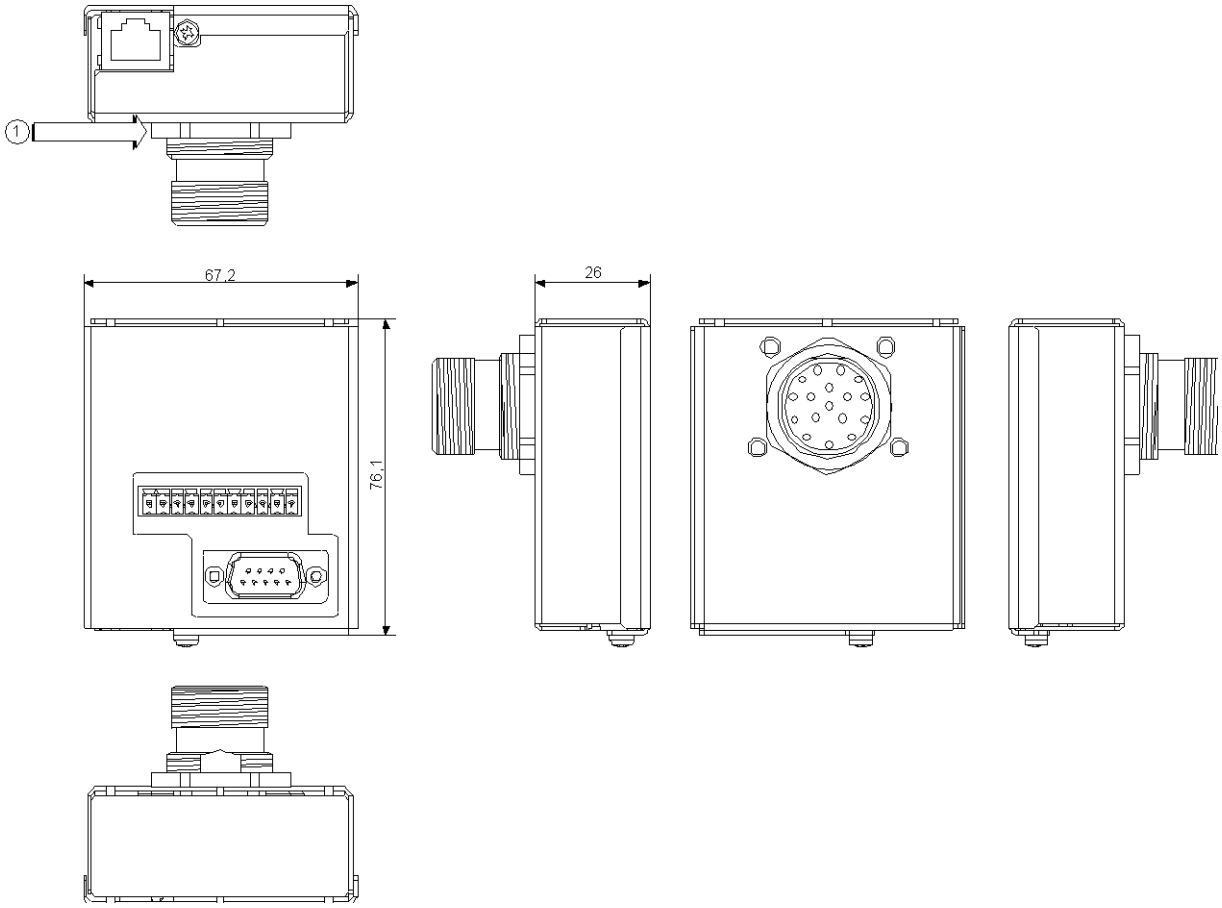


Fig.10-6: View of the junction box JB 001

1 ... Mounting nut

© KEBA 2009

10.3.2 Connection

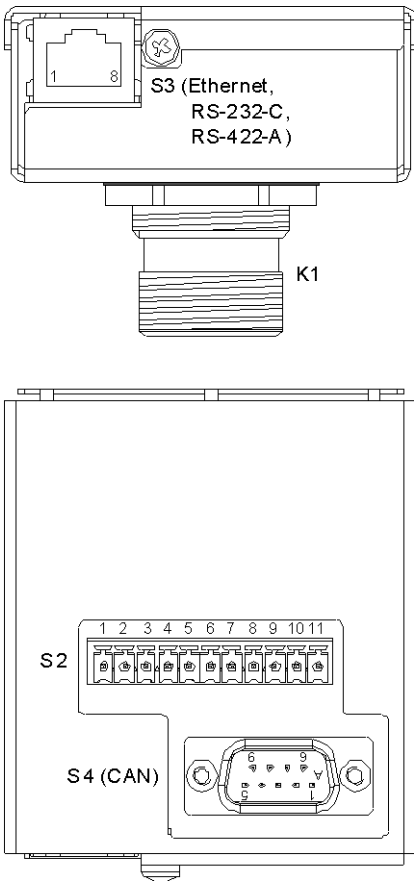


Fig.10-7: Connectors of the junction box JB 001

K1... 17-pin Coninverse female connector for the KeTop connection cable	S2... 11-pin terminal block for power supply, emergency stop switch and enabling switch (for this terminal block a plug will be needed, see below).
S3... RJ-45 female connector for Ethernet, RS-232-C or RS-422-A connection	S4... 9-pin DSUB male connector for CAN connection

10.3.2.1 Order data of the plug for the terminal block S2

For the terminal block S2 a separate plug is required. This plug with material number FMC 1.5/11-ST-3.5 can be orderd at "Phoenix".

10.3.3 Connection diagram

The connection diagramm shows the connection of power supply, control lines (emergency stop switch and enabling switch) and data lines via the junction box.

KEBA © KEBA 2009

WARNING!

Danger to persons by electric shock!

- **Only supply the device with power from voltage sources having protective extra-low voltage (e.g. SELV or PELV acc. to IEC 61131-2)**
- **Only connect voltages and circuits which are safely separated from dangerous voltages (e.g. by means of sufficient insulation) to connections, terminals or interfaces up to a rated voltage of 50 V.**

Information

- *Only **one** connector (S3-RJ45-Telplug for Ethernet **or** S4-DSSUB-plug for CAN) with active signals from the PLC is allowed to be connected. Otherwise conflicts between the CAN signals will occur.*
- *Due to the CAN-specific wiring on the SUB-D S4 connector, the connection of RS232-C or RS-422-A to this connector is not possible.*

10.3.3.1 Ethernet

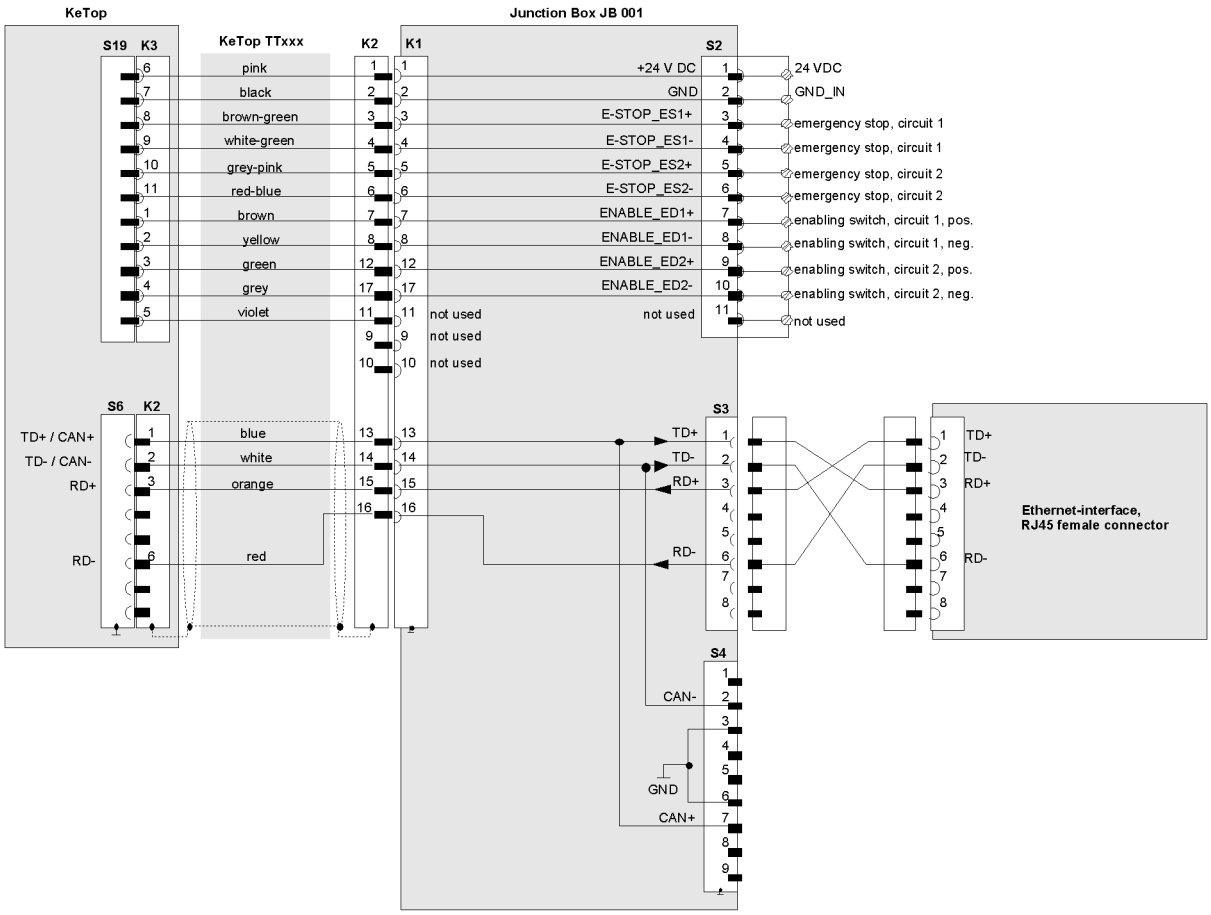


Fig.10-8: Connection diagram for Ethernet: KeTop via junction box JB 001

© KEBA 2009

Information

Point-to-point connections between KeTop and PLC require a crossed cable.

10.3.3.2 CAN

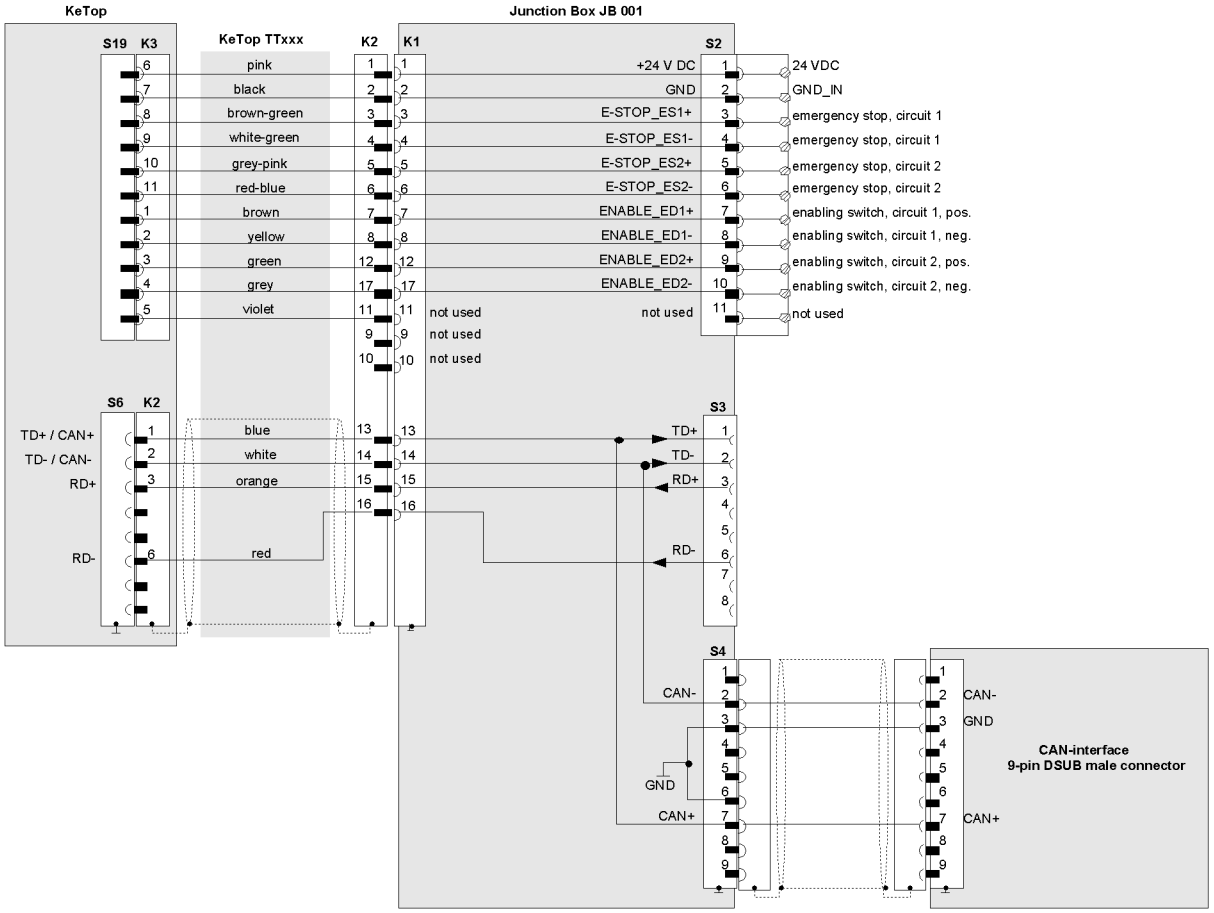


Fig.10-9: Connection diagram for CAN: KeTop via junction box JB 001

© KEBA 2009

10.3.3.3 RS-232-C

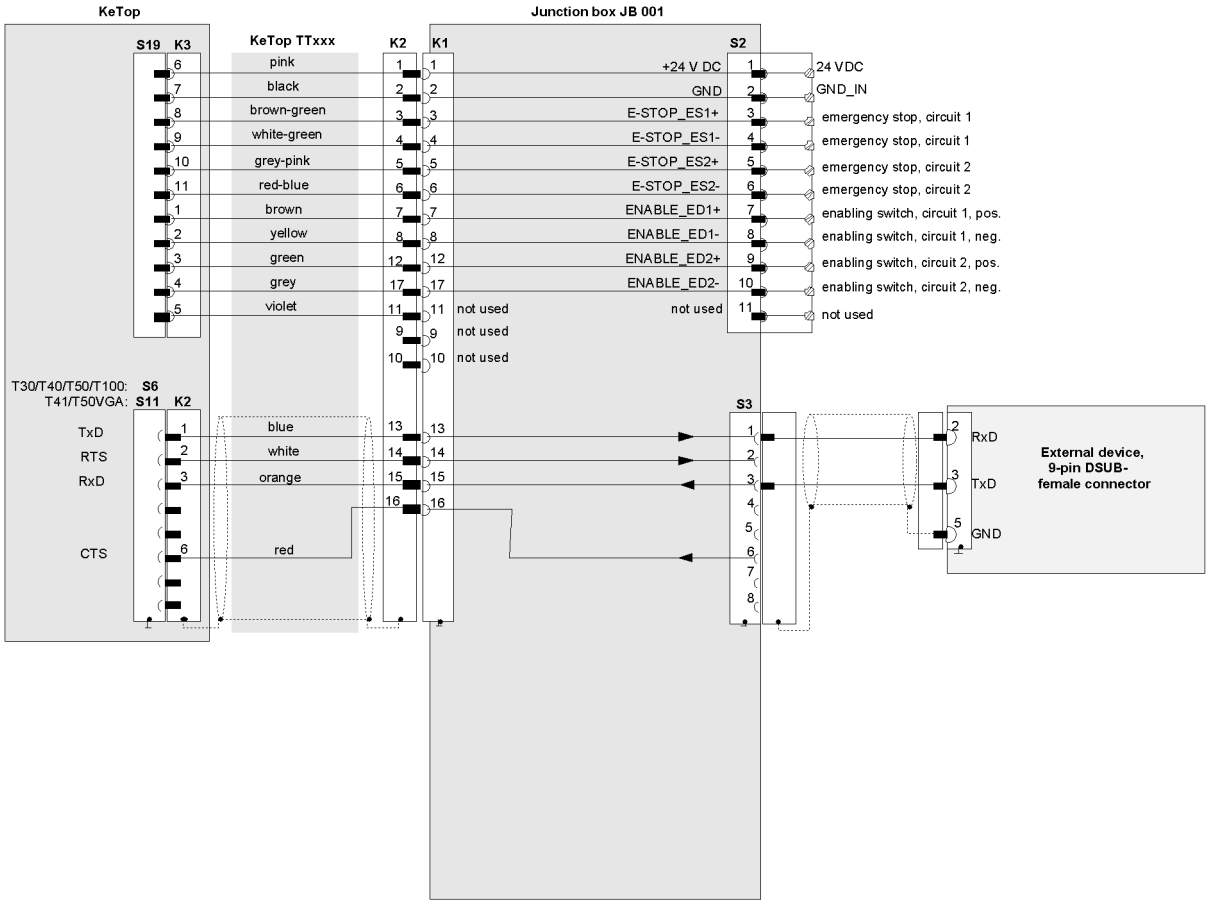


Fig.10-10: Connection diagram for RS-232-C: KeTop via junction box JB 001

© KEBA 2009

10.3.3.4 RS-422-A

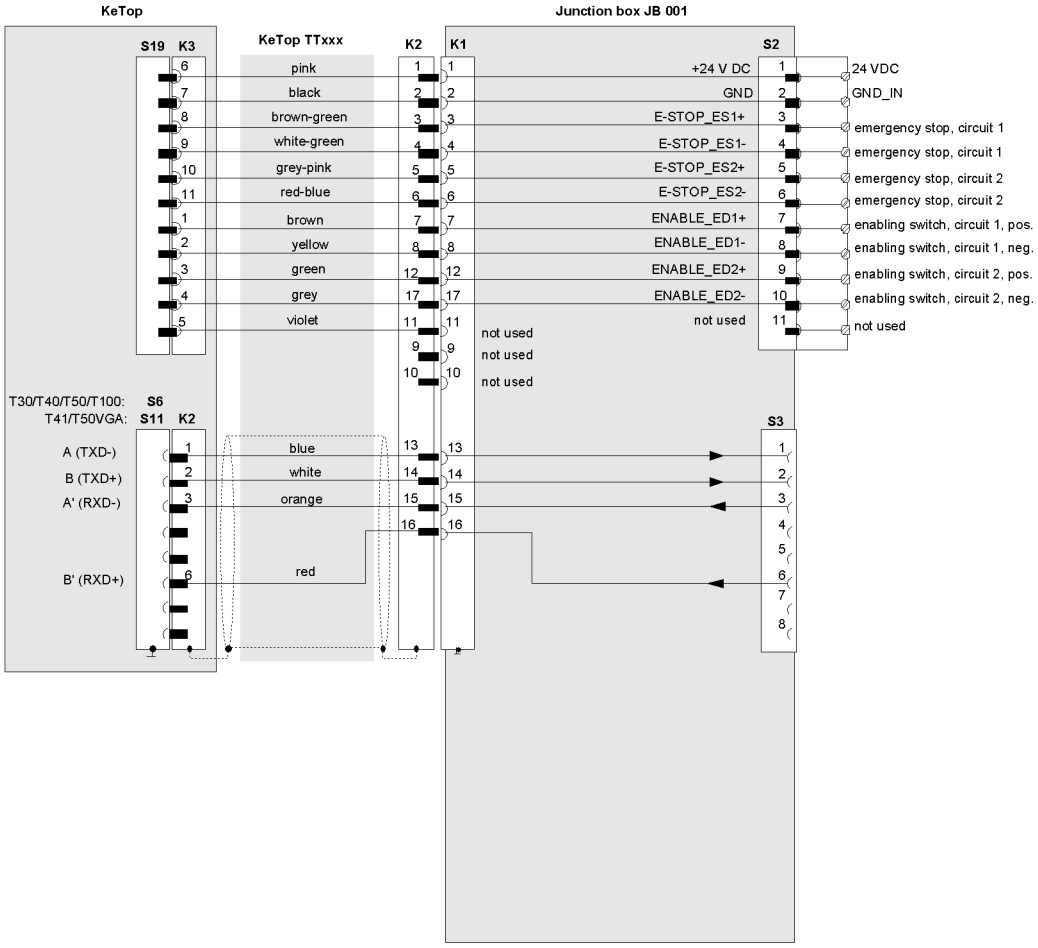


Fig.10-11: Connection diagram for RS-422-A: KeTop via junction box JB 001

10.3.4 Shielding inside the Control Cabinet

In many cases, several interference sources exist in the control cabinet, such as servo drive modules, transformers, contactors and relays. Therefore it is necessary to continue the cable shield from the connector shell (control cabinet) up to the PLC (continuous connection from handheld terminal up to PLC).

KEBA © KEBA 2009

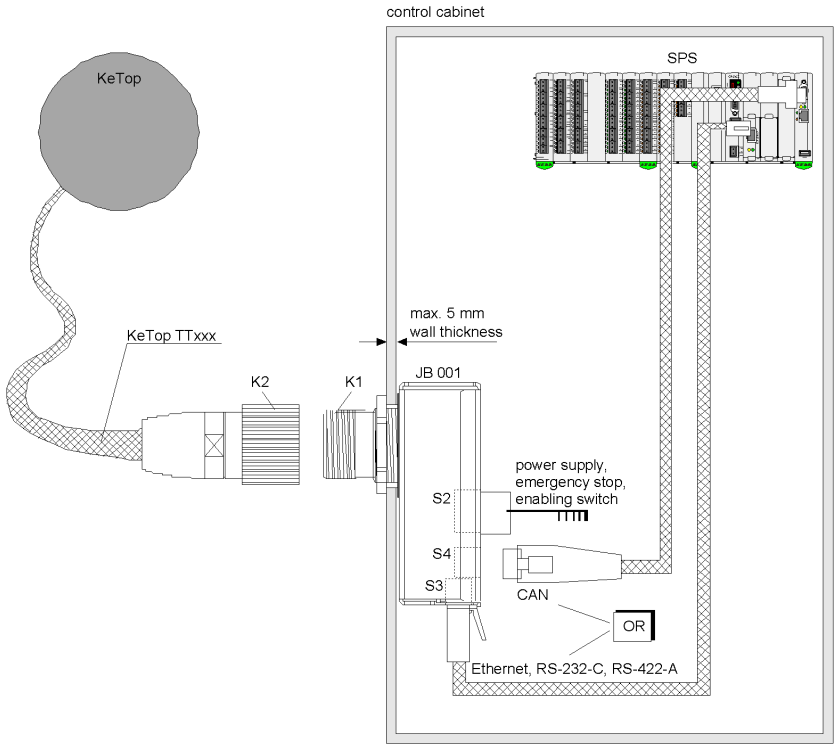


Fig.10-12: Shield connection in the control cabinet

10.3.5 Mounting Instructions

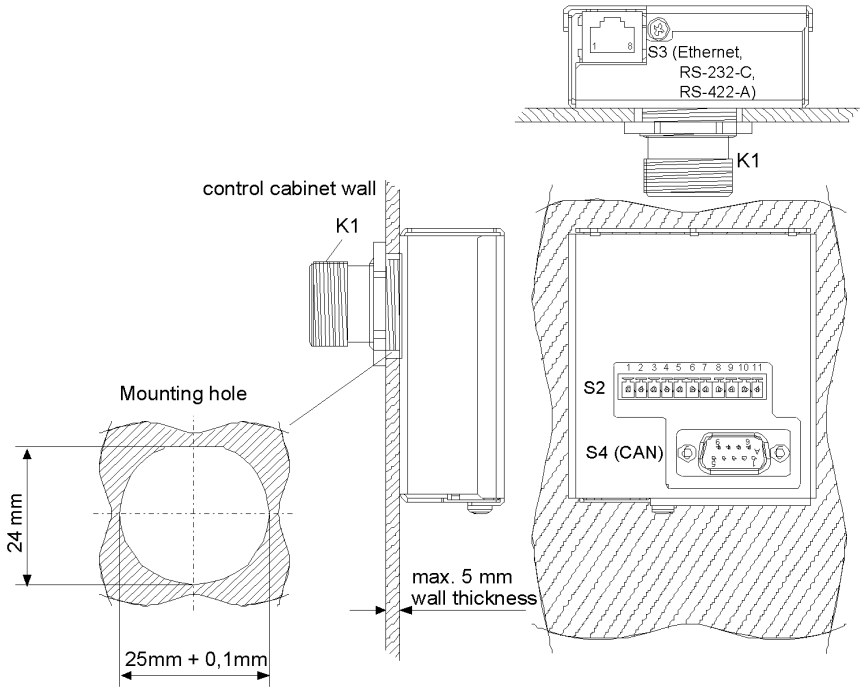


Fig.10-13: Dimensioned drawing for the opening for the S1 jack of the junction box

© KEBA 2009

10.3.6 Technical data of Junction Box JB 001

10.3.6.1 General data

Nominal supply voltage (KeTop):	24 V DC
Supply voltage range (KeTop):	18 V DC to 32 V DC
Max. interruption time of the supply (KeTop):	≤ 10 ms (acc. to EN 61131)
Power consumption:	
without KeTop:	-
with KeTop:	see corresponding KeTop User Manual
Inrush current (KeTop):	see corresponding KeTop User Manual
Safety class:	III in accordance with EN 61131-2 and EN 50178

10.3.6.2 Environmental conditions

Operating temperature:	5 °C to 55 °C (41 °F to 131 °F)
Storage temperature:	-25 °C to +70 °C (-13 °F to 158 °F)
Relative humidity (non-condensing):	5 % to 95 %
Vibration resistance (operation):	(IEC 60068-2-6)
	5 Hz ≤ f < 9 Hz at 7 mm (0.276 in)
	9 Hz ≤ f < 150 Hz at 2 g (0.0044 pound)
Shock resistance (operation):	15 g / 11 ms (IEC 60068-2-27)

10.3.6.3 Housing

Construction:	Steel panel housing, blue zinc coated
	Withstands grease, oil, lubricants, alcohol, etc.
Flammability class:	UL94-V0
Dimensions:	
Width:	67.2 mm (2.6457 in)
Height:	76.1 mm (2.9961 in)
Depth:	26 mm (1.0236 in)
Protection degree:	IP20
Weight:	220 g (0.485 lb)

10.4 KeTop CB211 Connection Box

The KeTop CB211 connection box is used for integration of the KeTop in the machine/system. It is suitable for wall mounting and can also be mounted on a mounting rail through the use of the mounting rail assembly kit (KeTop DR200). The KeTop CB211 connection box has the following connections:

KEBA © KEBA 2009

10.4.1 Construction

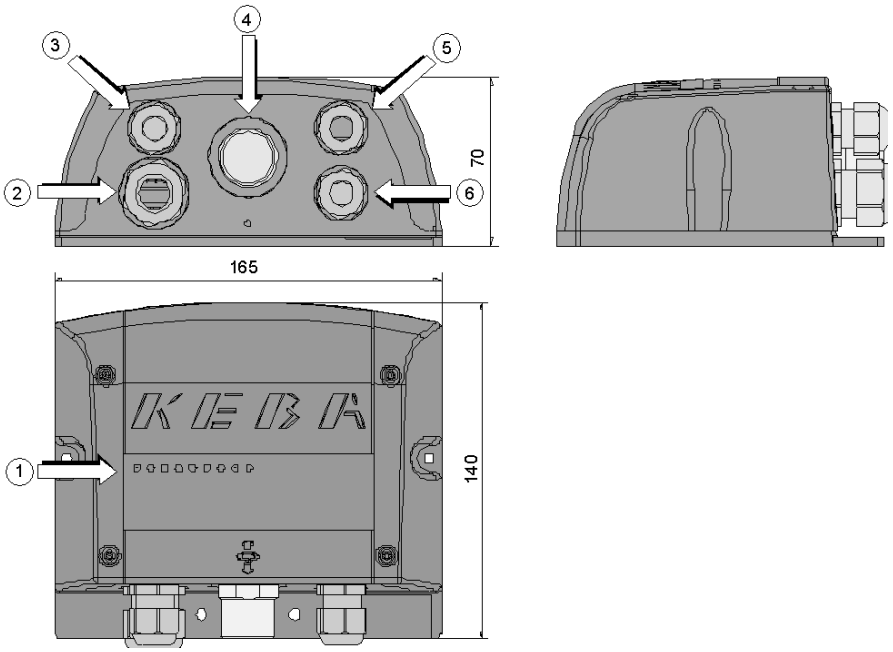


Fig.10-14: View and device description of the Gateway box

1 ... Status and error LEDs	2 ... PG gland (M20) for voltage supply, enabling switch and emergency stop
3 ... PG gland (M16) for separate functional ground (status as supplied with dummy plugs)	4 ... Coninvers female connector for KeTop connection cable
5 ... PG glands (M16) for data lines	6 ... PG glands (M16) for data lines (status as supplied with dummy plugs)

WARNING!

Danger to persons by electric shock!

- **Only supply the device with power from voltage sources having protective extra-low voltage (e.g. SELV or PELV acc. to IEC 61131-2)**
- **Only connect voltages and circuits which are safely separated from dangerous voltages (e.g. by means of sufficient insulation) to connections, terminals or interfaces up to a rated voltage of 50 V.**

© KEBA 2009

10.4.2 Interior view

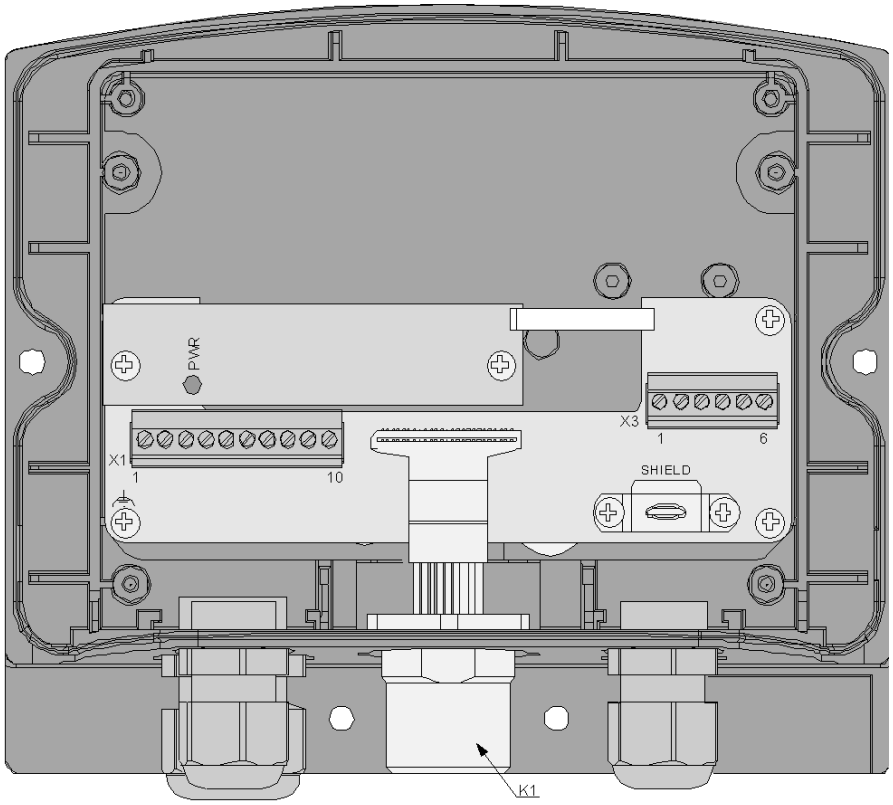


Fig.10-15: Interior view of connection box

K1... 17-pin female connector (Coninvers) for KeTop connection cable	X1 ... Terminal block for power and control lines (enabling switch and emergency stop)
X3... Terminal block for data lines	SHIELD... Cable shield clamp with connection surface for cable shield of data lines (not used for strain-relief of the cable!)

Details about connecting the connection box KeTop CB 211 to the KeTop see subchapter "Wiring diagram" of the main chapters "Ethernet" and "RS-422-A".

10.4.3 Technical data of the connection terminals

The following technical data apply to the X1 and X3 connector terminal blocks already available in the Junction box:

Connection capacity:	
rigid / flexible / wire gages: [mm²]/[mm²]/AWG	0.14-1.5 / 0.14-1.5 / 28-16
flexible with wire end ferrules without / with plastic sleeve: [mm²]	0.25-1.5 / 0.25-0.5
Grid dimension:	3.81
Insulation length: [mm²]	7
Tightening torque: [Nm]	0.22-0.25

PHOENIX order data:

KEBA © KEBA 2009

Gateway-terminal block	PHOENIX	
	Type	Part no.
X1	MCVR 1.5/6-ST-3.81	1827169
X3	MCVR 1.5/7-ST-3.81	1827172
X4, X4B	MCVR 1.5/10-ST-3.81	1827208

Information

- *Consider the connection capacity of the terminal blocks when selecting the connection cable.*
- *Use the following screwdriver to connect the wires to the terminal blocks: Blade: 0.4 x 2.5 x 80 mm, Length: 160 mm*
- *Multi-line connections (2 wires in one terminal) are not allowed. Use the X4B terminal block for continuing the field bus.*

© KEBA 2009

10.4.4 Drilling template for wall mounting

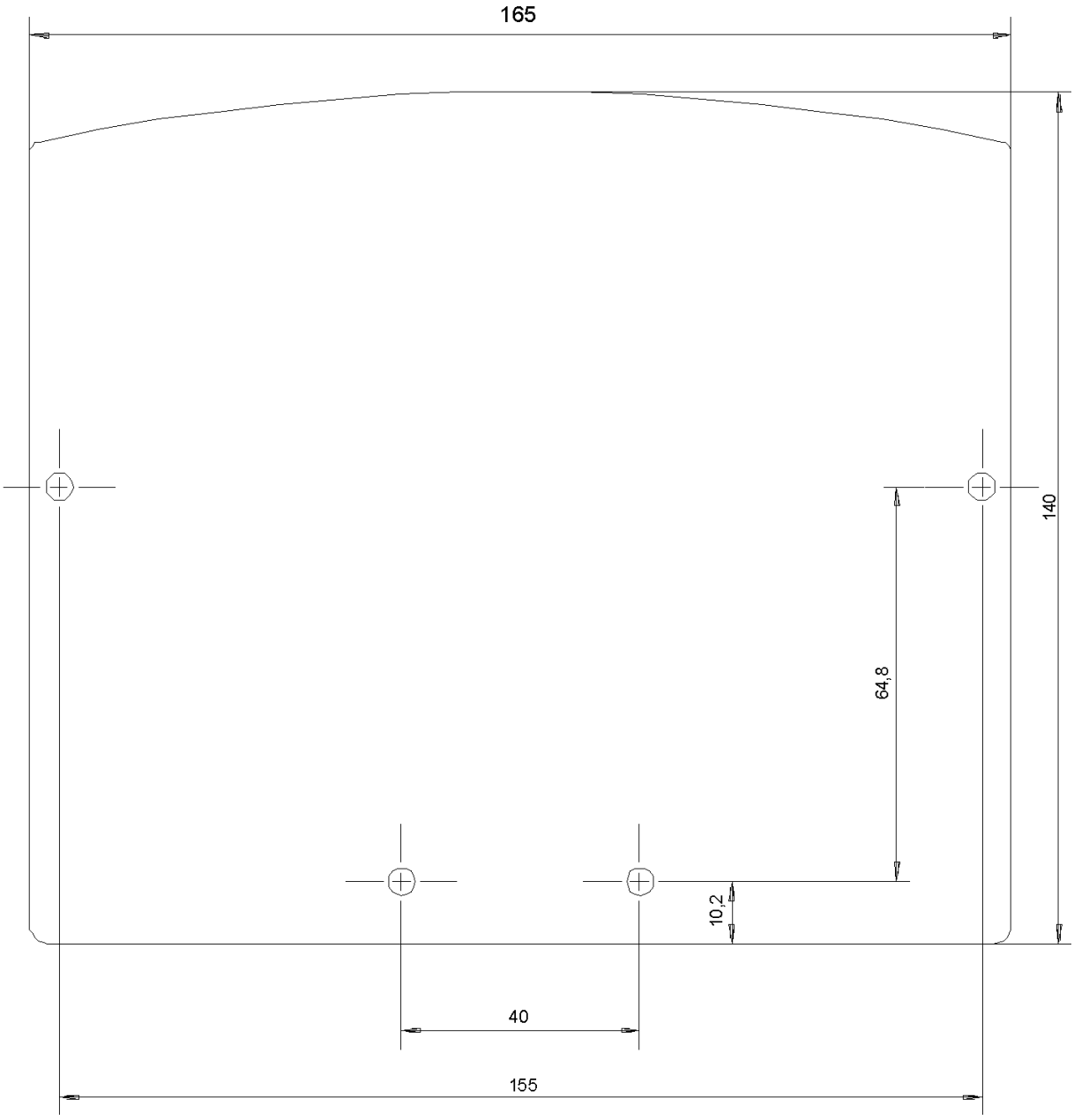


Fig.10-16: Drilling template for the Gateway box

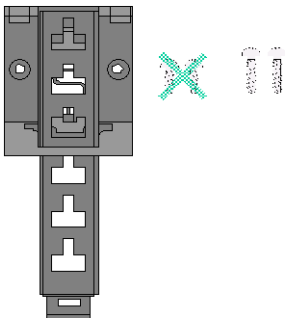
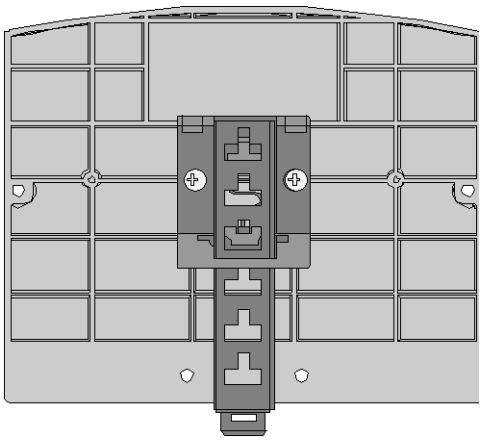
For wall mounting, we recommend the following screws and materials:

- Chipboard screw: Ø 4 x 40mm
  Head form: flat head
  Max. head diameter: Ø 9 mm
- Recommended rawlplug: Ø 6 x 30mm

KEBA © KEBA 2009

10.4.5 DIN Rail Holder Mounting Set KeTop DR200

The DIN rail holder KeTop DR200 is available as accessory and will be mounted on the rearside of a KeTop CB2xx gatewaybox. So the gatewaybox can be easily snapped onto a DIN rail.

	
DIN Rail Holder Mounting Set	DIN Rail Holder fixed on the rear side of the gateway-box

Tab.10-17: DIN Rail Holder Mounting Set for gatewaybox

© KEBA 2009

10.4.6 Use of Connection Box

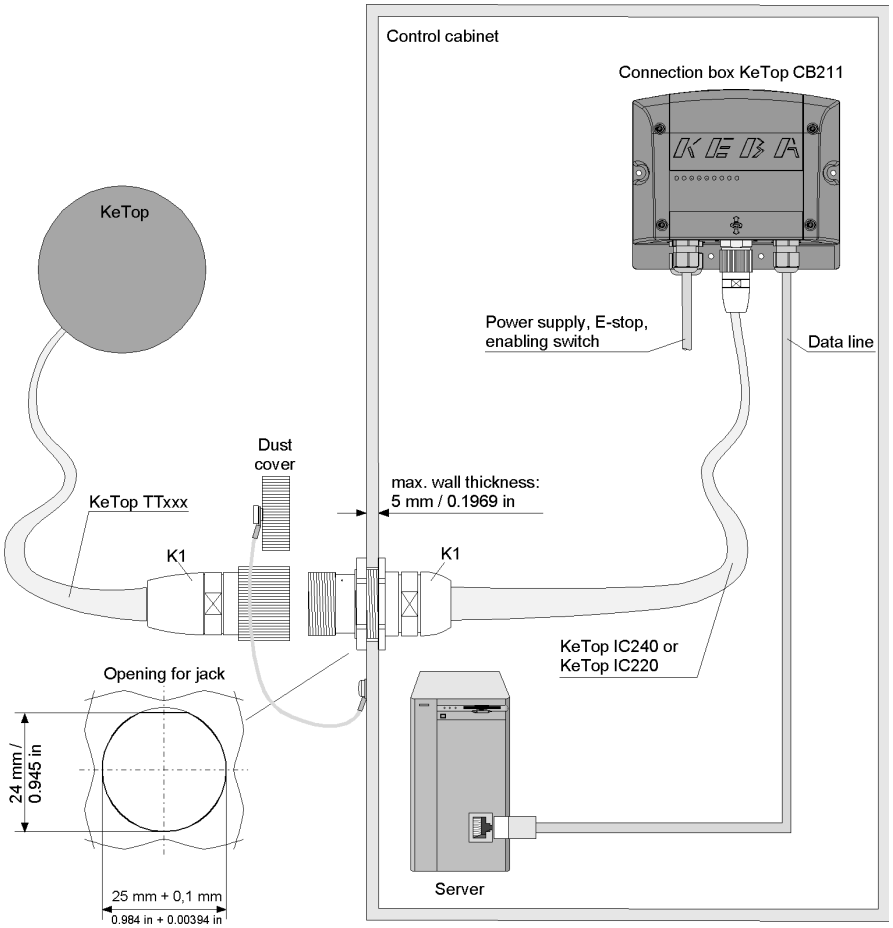


Fig.10-18: Connection box KeTop CB211 in control cabinet

10.4.7 Minimum Bending Radius of Cable

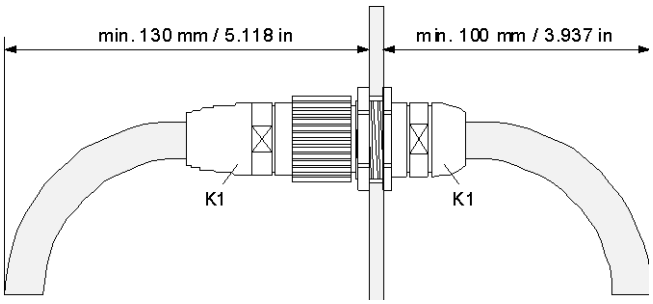


Fig.10-19: Required minimum distance outside and inside the control cabinet

10.4.8 Technical Data of Connection Box KeTop CB211

10.4.8.1 General data

Nominal supply voltage:	24 V DC (Safety extra low voltage)
Supply voltage range:	18 V DC to 32 V DC

© KEBA 2009

Maximum interruption time of supply voltage:	≤ 10 ms (following EN 61131)
Power consumption:	10.8 W (600 mA at 18 V DC, 450 mA at 24 V DC)
Inrush current:	max. 5.6 A (with limitation of current)
Safety class:	III in accordance with EN 61131-2 and EN 50178

10.4.8.2 Environmental conditions

Operating temperature:	0 °C to 50 °C (32 °F to 122 °F)
Storage temperature:	-20 °C to +70 °C (-4 °F to 158 °F)
Relative humidity (non-condensing):	5 % to 95 %
Vibration resistance (operation):	(IEC 60068-2-6)
	5 Hz ≤ f < 9 Hz with 7 mm (0.276 in)
	9 Hz ≤ f < 150 Hz with 2 g (0.0044 pound)
Shock resistance (operation):	15 g (0.033 pound) / 11 ms (IEC 60068-2-27)

10.4.8.3 Housing

Construction:	ABS housing
	Withstands grease, oil, lubricants, alcohol, etc.
Flammability class:	UL94-V0
Dimensions:	
Width:	160 mm (6.299 in)
Height:	140 mm (5.512 in)
Depth:	70 mm (2.756 in)
Protection degree:	IP65
Weight:	500 g (1.1 pound)
Display:	Status LEDs

10.4.8.4 Accessories

Intermediate cable:	Connection box to connection cable
KeTop IC220:	2 m / 6.56 ft
KeTop IC240:	4 m / 13.12 ft
Download cable:	
KeTop XD040:	4 m / 13.12 ft. For downloading software and for debugging via S2.
DIN Rail Holder Mounting Set	
KeTop DR200:	For mounting on the rearside of a KeTop CB2xx gatewaybox.
Strapping plug:	
KeTop BC001:	Serves for bridging the emergency stop circuits if the KeTop is unplugged.

10.5 Connection Cable KeTop TTxxx

The standard KeTop handheld terminals are available with the following cables:

- KeTop TT025 (2.5 m / 8.2023 ft)

© KEBA 2009

- KeTop TT050 (5 m / 16.4047 ft)
- KeTop TT100 (10 m / 32.8095 ft)
- KeTop TT150 (15 m / 49.2142 ft)
- KeTop TT200 (20 m / 65.6190 ft)

The KeTop connection cable withstands water, cleaning agents (alcohol and tensides), oil, drilling oils, grease and lubricants.

Description of signal	K3, 11-pin female connector to S19 on the KeTop	K2, 8-pin RJ-45 jack (S4, Ethernet)	Connection cable KeTop TTxxx, color of wires		K1, 17-pin male connector, pin No.:
24 V DC	6	-	pink	->	1
GND_IN	7	-	black	->	2
E-stop, circuit 1	8	-	brown-green	->	3
E-stop, circuit 1	9	-	white-green	->	4
E-stop, circuit 2	10	-	grey-pinki	->	5
E-stop, circuit 2	11	-	red-blue	->	6
enabling switch, circuit 1, pos.	1	-	brown	->	7
enabling switch, circuit 1, neg.	2	-	yellow	->	8
enabling switch, circuit 2, pos.	3	-	green	->	12
enabling switch, circuit 2, neg.	4	-	grey	->	17
not used	n.c.	-	-	-	9 *
not used	n.c.	-	-	-	10 *
GND	5	-	violet	->	11
TD+ | CAN+	-	1	blue	->	13
TD- | CAN-	-	2	white	->	14
RD+ | SGND	-	3	orange	->	15
RD- | not used	-	6	red	->	16

* ... Bridge at jack K1: between pin 9↔10

Tab.10-20: Pin assignment at connection cable KeTop TTxxx

KEBA © KEBA 2009

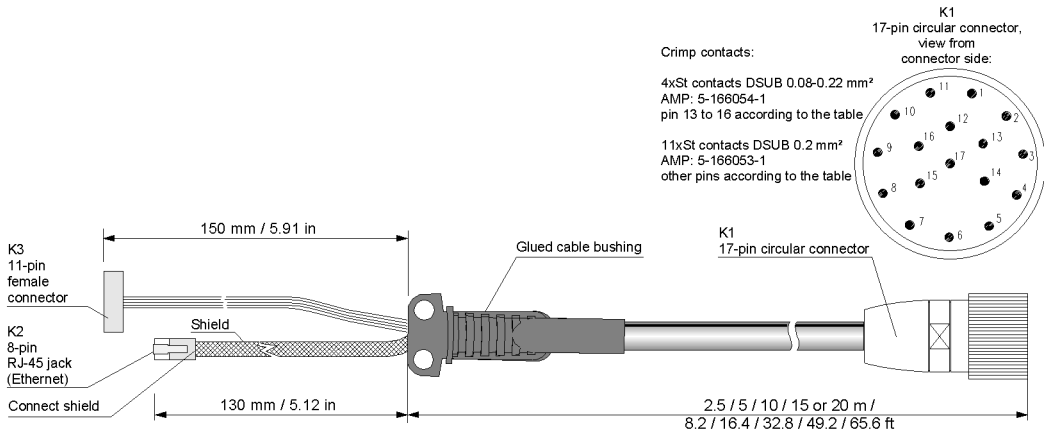


Fig.10-21: Connection cable KeTop TTxxx

10.6 Intermediate Cable KeTop IC2xx

The KeTop intermediate cable is used to connect the connection box and the jack in the wall of the control cabinet. Cables with the following lengths are available:

- KeTop IC240 (4 m / 13.1238 ft)
- KeTop IC220 (2 m / 6.5619 ft)

The KeTop connection cable withstands water, cleaning agents (alcohol and tensides), oil, drilling oils, grease and lubricants.

Description of signal	K1, 17-pin female connector, pin No.:	Intermediate cable ICxxx, color of wires		K2, 17-pin male connector, pin No.:
Enabling switch, circuit 1, pos.	7	brown	<-	7
Enabling switch, circuit 1, neg.	8	yellow	<-	8
Enabling switch, circuit 2, pos.	12	green	<-	12
Enabling switch, circuit 2, neg.	17	grey	<-	17
n.c.	10	n.c.	<-	10
24 V DC	1	pink	<-	1
n.c.	9	n.c.	<-	9
Emergency stop, circuit 1	3	brown-green	<-	3
Emergency stop, circuit 1 GND	4	white-green	<-	4
Emergency stop, circuit 2	5	grey-pink	<-	5
Emergency stop, circuit 2 GND	6	red-blue	<-	6
GND_IN	2	black	<-	2
TD+ (transmit) *	13	blue	<-	13
TD- (transmit) *	14	white	<-	14
RD+ (receive) *	15	orange	<-	15

© KEBA 2009

Description of signal	K1, 17-pin female connector, pin No.:	Intermediate cable ICxxx, color of wires		K2, 17-pin male connector, pin No.:
RD- (receive) *	16	red	<-	16
GND	11	violet	<-	11

* ... Shielded signals

Tab.10-22: Pin assignment of intermediate cable KeTop IC2xx

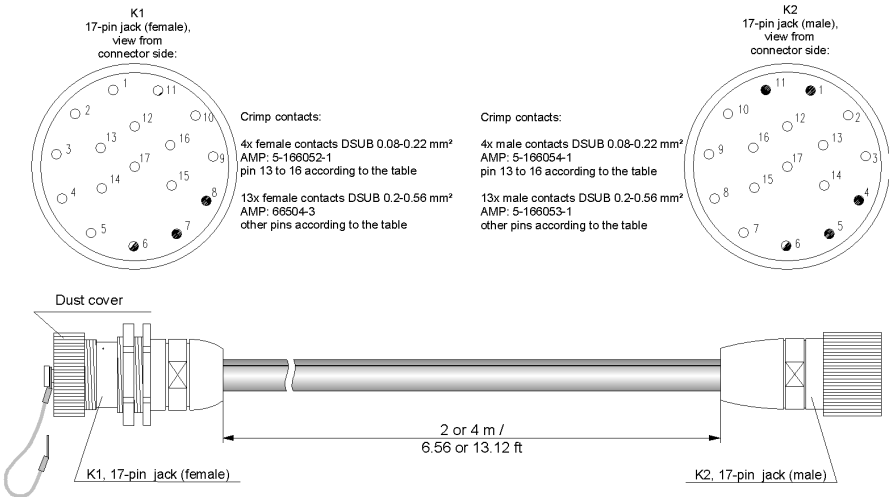


Fig.10-23: Intermediate cable KeTop IC2xx

10.7 Download Cable KeTop XD040

The download cable XD040 is available with a length of 4 m (13.12 ft) and plugged into the serial port connector in the cable entrance area of the KeTop or into the X6 of the KeTop CB23x Gatewaybox.

The cable is used for downloading software and for debugging.

Handheld Terminal KeTop xxxx		Gateway box KeTop CB23x		Download cable KeTop XD040			PC
Signals	Serial port connector	Signals	X6 Serial port connector	S1 male connector	Description of signals	S2, 9-pin DSUB female connector	Signals (COMx)
-	1*	n.c.	1	1	<->	1	(ActiveSync)
-	2*	n.c.	2	2	<->	6	(ActiveSync)
TXD	3	TXD	3	3	<->	2	RXD
CTS	4	n.c.	4	4**	<->	-	-
RXD	5	RXD	5	5	<->	3	TXD

KEBA © KEBA 2009

RTS	6	n.c.	6	6	<->	-	-
-	7*	n.c.	7	7	<->	4	(Active-Sync)
n.c.	8	n.c.	8	8**	<->	9	-
GND	9	GND	9	9	<->	5	GND
GND	10	n.c.	10	10	<->	-	not used
						7	not used
						8	nicht verw.

*	... The pins 1, 2 and 7 of the serial port connector S2 are short circuited directly on the CPU board of the KeTop. If you produce the serial download cable yourself you will need these three wires in the cable for the ActiveSync signal.
**	... One pin has been removed from the male connector (prevents from incorrect plugging in).

Tab.10-24: Pin assignment of download cable KeTop XD040

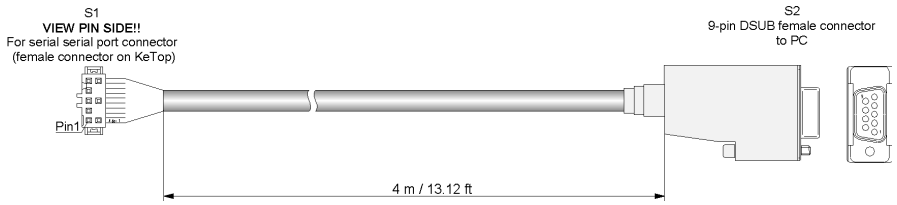


Fig.10-25: Download cable XD040

© KEBA 2009

11 Transport Conditions

To avoid damaging the KeTop during further or return transport, the following transport conditions must be fulfilled:

- Always use the original packaging for the transport.
- The environmental conditions for the KeTop (see chapter "Technical Data") must also be fulfilled during transport.

KEBA © KEBA 2009

12 12 Disposal of the KeTop

CAUTION

Please take care of regulations for disposal of electric and electronic devices!

- The symbol with the crossed-out garbage can point out that electrical and electronic devices inluding their accessories should not be disposed in the household garbage.
- Depending on their coding, the raw materials are recyclable. By disposing of such used devices correctly, you can ensure that they can be reused, their raw materials recycled or put to another use, and you will be making an important contribution to the protection of our environment!

© KEBA 2009

13 Technische Daten

13.1 Allgemein

Nominal supply voltage:	24 V DC
Supply voltage range:	18 V DC to 32 V DC
Maximum interruption time of supply voltage:	≤ 10 ms (acc. to EN 61131)
Power consumption:	7.2 W (400 mA at 18 V DC, 300 mA at 248 V DC)
Inrush current:	max. 5.6 A (with limitation of current)
Safety class:	III in accordance with EN 61131-2 and EN 50178

13.2 Environmental conditions

Operating temperature:	0 °C to 50 °C (32 °F to 122 °F)
Storage temperature:	-20 °C to +70 °C (-4 °F to 158 °F)
Relative humidity (non-condensing):	5 % to 95 %
Vibration resistance (operation):	(IEC 60068-2-6)
	10 Hz ≤ f < 57 Hz with 0.15 mm (0.0059 in)
	57 Hz ≤ f < 150 Hz with 2 g (0.0044 pound)
Shock resistance (operation):	25 g (0.055 pound) / 11 ms (IEC 60068-2-27)

13.3 Housing

Construction:	double walled ABS housing
	Withstands grease, oil, lubricants, alcohol, etc.
Flammability class	UL94-V0
Dimensions	
Diameter	290 mm / 11.417 in
Total height incl. handle:	130 mm / 5.118 in
Protection degree:	IP54
Weight:	1800 g / 3.968 pound (with emergency stop, without handwheel, without Override, without cable)
Display 7.7“:	
Type:	Graphics-capable color STN LC display
Size:	7.7“ (160 x 120 mm)
Resolution:	VGA 640 x 480 pixels
Representation:	256 colors
Background lighting:	CCFT cold cathode tube (min. lifetime 40,000 hours)
Touch screen:	Analog-resistive
Display 8.4“:	
Type:	Graphics-capable color TFT display
Size:	8.4“ (175 x 130 mm)
Resolution:	SVGA 800 x 600 pixels

KEBA © KEBA 2009

Representation:	65535 colors
Background lighting:	CCFT cold cathode tube (min. lifetime 40,000 hours)
Touch screen:	Analog-resistive
Keypad:	
	- Membrane keypad with tactile feedback
	- Keys laid out for thumb operation
	- Left / right-hand operation
	- Customer-specific keypad possible
	- 2 status LEDs
Operating elements:	Two 3-position enabling switches, twin circuit
Options:	
	Override potentiometer
	Electronic handwheel
	Joystick
	Emergency stop switch
2 locations for:	Illuminated push-button, momentary 0
	Illuminated push-button, momentary I
	Illuminated push-button, maintaining I/0
1 location for:	Illuminated push-button, momentary 0
	Illuminated push-button, momentary I
	Illuminated push-button, maintaining I/0
	Key switch, 3 positions: I-0-II / 0-I-II
	Key switch, 3 positions: I-0-II / 0-I-II

13.4 Processor and interfaces

Processor:	Intel StrongARM SA-1110/206 MHz
Memory:	DRAM: max. 128 MB, FLASH: 64 MB
Interfaces:	Ethernet
	RS-422-A
	RS-232-C (debug interface in the device)
	PC card slot (PC card type I, II, III)
Operating system:	Windows CE 4.2

13.5 E-Stop ratings

Rated voltage:	24 V DC
Minimum current:	10 mA (each contact)
Maximum current:	1000 mA (each contact)
Utilization category:	DC-13 (in accordance with IEC 60947-5-1)
EAO BR 61:	
B_{10d}:	100 000

© KEBA 2009

13.6 Enabling device

Output type:	Solid-state output
Rated voltage:	24 V DC (voltage tolerance 19.2 V DC to 30 V DC according to EN 61131-2)
Rated current:	500 mA (max.)
Max. current up to output cut-off:	
circuit 1:	1.5 A
circuit 2:	0.8 A
Max. inductive load:	145mJ / 1.16 H @ 24 V DC, 500 mA (comparable with DC13 according to EN 60947-5-1)
Reverse polarity protection:	Yes
Short circuit and overload protection:	Yes
Operating cycle:	
2nd position:	10^5
3rd position:	5×10^4
Actuating force:	
from 1st position to 2nd position:	5 N typically
from 2nd position to 3rd position:	20 N typically
Data according to EN ISO 13849-1:2008:	
Enabling:	
Category:	3
Performance Level:	d
Proof Test Interval:	20 years
$MTTF_d$ symmetrized according to D.2 at EN ISO 13849-1:	83 years *
PFH_d:	1.35×10^{-7}
Panic:	
Category:	3
Performance Level:	d
Proof Test Interval:	20 years
$MTTF_d$ symmetrized according to D.2 at EN ISO 13849-1:	94 years *
PFH_d:	1.14×10^{-7}

* The monitoring device was not taken into consideration when calculating the $MTTF_d$-values. You can also refer to *chapter 4.5.1.2 "Panic" on page 27* and *chapter 4.5.2 "Example of Connection with PILZ PNOZ s6.1 Control Relay" on page 29*.

13.7 Accessories

Wall bracket:	For stationary operation or storage of the KeTop.
KeTop WB 090:	Wall bracket without cable suspension.
KeTop WB 095:	Wall bracket with cable suspension.
KeTop WB 110:	Wall bracket with cable suspension.
KeTop WB 120:	Wall bracket with cable suspension and solenoids.

KEBA © KEBA 2009

Connection cable:		Resistent to twisting, bending and foot traffic,with 20-pin push pull connector or 17-pin circular connector.
	KeTop TT025:	2.5 m / 8.2 ft
	KeTop TT050:	5 m / 16.4 ft
	KeTop TT100:	10 m / 32.8 ft
	KeTop TT150:	15 m / 49.2 ft
	KeTop TT200:	20 m / 65.6 ft
Intermediate cable:		Connection box to connection cable
	KeTop IC220:	2 m / 6.56 ft
	KeTop IC240:	4 m / 13.12 ft
Download cable:		
	KeTop XD040	4 m / 13.12 ft. For downloading software and for debugging via S2 (KeTop) or via X6 (KeTop CB23x).
Connection / Gateway boxes:		(KeTop CB23x not for KeTop T30)
	KeTop CB211:	Connection box for separating the data and control lines.
	KeTop CB230:	Gateway box for connecting to CAN via the RS-422-A interface
	KeTop CB234:	Gateway box for connecting to InterBus via the RS-422-A interface
	KeTop CB235:	Gateway box for connecting to PROFIBUS-DP via the RS-422-A interface
Visualization software:		Nur für KeTop T100 und KeTop T50
	KeTop PT001:	zenOn 5.50
Start Kit:		
	KeTop SK001:	Manuals English/German on CD SDK for Windows CE Programming tool KeTop PS040 Demo application zenOn 5.50 Demo application for PLCs

13.8 Spare parts

Touch styluses:		
	KeTop E-TP001:	3 original KeTop touch styluses

© KEBA 2009

14 CE Conformity, Directives and Standards

14.1 European Union Directives

It is a fundamental goal of the European Union to create an internal market within Europe and, linked to this, the dismantling of trade barriers.

In order to achieve this goal, the European Treaties guarantee “four freedoms“:

- Free trade in goods
- Right of establishment
- Free exchange of goods and services
- Free movement of capital

Free trade in goods means that quantitative import restrictions on goods are prohibited between the member states.

Goods that are hazardous to the safety of people or the environment are excluded. Such products can be disallowed by member states in their sovereign territory.

In order that free trade may also be guaranteed for these products, the national safety regulations of the member states are harmonised by means of European Union Directives.

These Directives exist for a range of product classes, such as machinery, medical products and toys. However, Directives have also been compiled for further common product safety aspects, such as protection from electricity and explosion, and electromagnetic compatibility.

The Directives are aimed at the member states, whose task is to convert them into national law. The Directives therefore have legal character.

CE marking certifies that the manufacturer fulfils all obligations in relation to the product on the basis of the EC Directives.

The CE mark is the “passport” within the EC and is defined on behalf of the supervisory authorities.

Additionally independent, accredited notified bodies can be commissioned to carry out an EC type-examination and draw up a certificate.

It is not, however, a safety mark or mark of conformity, which can only be awarded by independent testing agencies.

Both the Electromagnetic Compatibility Directive (EMC 89/336/EC) and the Machinery Directive (MD 2006/42/EC) are applicable to the handheld terminals.

14.2 Machinery Safety

Additional measures must be taken wherever faults arising in the machinery may cause personal injury or significant material damage. These measures

KEBA © KEBA 2009

must also guarantee a safe operating condition for the whole system in the event of a fault.

Although the handheld terminal is not, strictly speaking, a machine, it does, however, perform important tasks to guarantee the safety functions of a machinery to which it is attached.

The handheld unit has, for example, the “Emergency Stop" safety function and an enabling device for use in special operating modes. It is, as a result, a “Safety Component" in the sense of the Machinery Directive.

Safety components, or parts whose failure or faulty operation put the safety of people within the hazard area of the machine in danger, fall expressly within the range of application of the Machinery Directive.

The fundamental requirements that the Machinery Directive places on the manufacturer are as follows:

- To carry out a hazard and risk analysis
- To comply with the integration of safety principles
- To compile and keep a technical construction file
- To provide solutions in accordance with the latest state of the art
- To recognise conformity by means of harmonised Standards
- To apply CE marking

The same basic requirements apply to safety components. In their particular case, it must be proven that failure or malfunction are not possible, or that malfunction does not lead to a hazardous situation.

14.2.1 "Hazard and Risk Analysis"

The manufacturer of a machine is required to analyse its machine throughout its operating life and in all modes of operation, and to document all hazards that may possibly arise. This has to be done without taking into account possible protection devices.

The next step is to formulate a goal for protection against each identified hazard and subsequently to define one or more protective measures to achieve the protection goal.

Further details about the procedure for carrying out the hazard and risk analysis and lists of commonly occurring hazards can be found in the following Standards:

- EN 12100-1 and EN 12100-2 "Safety for machinery - Basic concepts, general principles for design"
- EN 14121-1 "Safety of machinery - Risk assessment"

14.2.2 "Principles for the Integration of Safety"

In Appendix I, Chapter 1.1.2 of the Machinery Directive 2006/42/EC there is a clear procedure and sequence for the selection of protective measures:

© KEBA 2009

14.2.2.1 Eliminating or minimising the hazards

This takes place at the design stage of the machine. These measures include, for example:

- A reduction in the use of energy (power, revolutions, voltages etc.) as far as this is possible
- The avoidance of unnecessary sharp points or edges
- The avoidance of human errors by means of the ergonomic and logical design of operating devices
- The avoidance of hazardous materials and commodities

14.2.2.2 Taking protective measures against hazards that cannot be eliminated

These measures include, for example:

- Guards, railings, housings
- Protective devices (light barrier for hazard elimination)
- Protective control equipment (enabling devices, two-hand controls, speed monitoring etc.)

14.2.2.3 User information about residual hazards

This last of the three options is used if residual hazards remain after the first two options have been applied. These measures include, for example:

- Warning notices
- Training and organisational measures
- The use of personal protective equipment

14.2.3 "Technical Construction File"

The technical construction file contains all the documents that are required to prove the safety of the machinery / safety component. These are, for example:

- A complete drawing of the machinery or safety component including control circuit diagrams
- Hazard and risk analysis
- Calculations
- Research and test results
- A list of the basic safety requirements of the Machinery Directive applicable to the machine and a description of the solutions
- Applied Standards
- Operating instructions
- A list of the quality assurance measures in the procedure

The technical construction file must be retained for a minimum of 10 years after the supply of the last product, and must be presented within a period of a few days in the event of a claim for damages.

KEBA © KEBA 2009

14.2.4 "State of the Art"

This means technical possibilities at a certain point of time that are based on certain scientific and technical knowledge. The state of the art also means something that is commercially viable, that is it can be realised by the majority in the industrial sector concerned.

The state of the art is defined as the state of development of advanced procedures, equipment or operating methods, that makes the practical applicability of the measure appear assured overall in respect of the targeted goals (e.g. the goals of protection of work, protection of the environment, safety of third parties and operating efficiency: namely to achieve a generally high level overall in relation to the aspects under consideration).

The state of the art can develop further irrespective of the Standards.

14.2.5 "Recognition of Conformity by means of Harmonised Standards"

The European Directives mainly contain general requirements for the safety of products; however they do not contain details of how to carry them out.

The European Standards Institutes are responsible for this. They provide implementation proposals for real safety problems or specific product classes. Standards that are assumed to meet and correctly interpret the requirements of the Directives are known as “Harmonised Standards”. Most of the available Standards, however, are not harmonised.

By applying and implementing harmonised Standards, a manufacturer can claim conformity for the respective product. However, the Standards, in contrast to the Directives, are not legally binding. This means that the manufacturer may also take into consideration other solutions that are not described in the Standards; but these solutions must attain at least the same safety level as the relevant Standards and satisfy the requirements of the appropriate Directives.

14.2.6 Selection of Performance Level and Safety Categories in accordance with EN ISO 13849-1

The Machinery Directive demands that a fault in control circuit logic, or interference or damage thereto, shall not lead to a hazardous situation.

This general approach is substantiated in EN ISO 13849-1 "Safety of machinery - Safety related parts of control systems", which defines Performance Levels (PL a to e) for control parts that are relevant to safety. The PL depends on the safety category, the $MTTF_d$-value and the degree of coverage of diagnosis (DC_{avg}) of the corresponding safety circuit.

As in the preceding standard EN 954-1, the safety category describes the structure of the safety function. The Performance Level (PL), which describes the conditional probability of failure and the defect discernability of the safety function, has been added.

The selection of the PL has to be done by the manufacturer of a machine depending on the real risk potential. The risk potential will be be determined from a hazard and risk analysis. In case of hazards that can cause irrevisible injury or death usually a Performance Level not less than PL d is required.

© KEBA 2009

The category of the Performance Level determines if

- the system has been built in single circuit technology, which means that a failure will lead to a loss of safety, although the availability of components and parts is high (category 1)
- the system has been built in single circuit technology, which means that a failure will lead to a loss of safety, but the failure will be detected by the system and will be displayed somehow or other (category 2)
- the system has been built in multiple (2) circuit technology and that a fault will not lead to loss of safety (category 3) or
- the system has been built in multiple (2) circuit technology and a build up of multiple faults will not lead to loss of safety (category 4).

Starting from category 3 it is also important in this context that individual faults are detected in time to avoid a build up of faults, which may finally lead to loss of safety.

Faults that have to be detected in electric and electronic systems are for example short circuits between multiple circuits, interrupts, short circuits or contacts that are stuck together. Special certified safety control devices are often used to detect faults in the individual safety circuits. The PL quoted for these devices is only attained, however, if also the whole machine circuit under review lies within the scope of the respective PL. The PL must always be considered in relation to a complete safety function and not as applied to individual components or parts.

A guide for easily calculating the PL for a safety function consisting of several individual components can be found in standard EN ISO 13849-1 chapter 6.3 and appendix H and I.

If safety components are being connected in series, the individual component with the least PL determines the PL of the whole safety function. For example a safety function consisting of 3 components, one with category 4 PL e, another one with category 3 PL d and a third component with category 2 PL c will have a PL c for the whole safety function. This means that a fault will lead to loss of safety, although components with category 4 PL e are integrated into the safety function, as one of the components being used has category 2.

When chaining several PLs the overall PL can decrease. For more information read EN 13849-1 chapter 6.3.

The proof of attainment of a safety category can take place with the aid of an FMEA (Failure Mode and Effects Analysis), in which all the faults that could possibly arise are simulated, either theoretically or in practice, and it is demonstrated that the requirements of the category are fulfilled.

14.2.7 Application of Handheld Terminals in Special Operating Modes

For the manual control of machines in special operating modes, where safety depends on the timely reaction of the operating staff, it is absolutely essential that the operator can overlook the operating area.

The handheld terminal has the advantage that the operator can get very close to the control panel.

KEBA © KEBA 2009

At the same time, the danger of misuse increases with mobility since, in remote locations where it is not possible to observe the operating area, machine movements can also be set in motion with the handheld terminal, knowingly or unknowingly.

The machine operator, therefore, has to find the right compromise between necessary flexibility and a reasonable limitation of the working range when selecting the corresponding cable length for the handheld terminal's.

It is not possible for the working range of radio-operated handheld terminal's to be limited by means of the cable; therefore additional technical solutions are required for these handheld terminal's.

If the machine or equipment is operated with the handheld terminal, care must be taken at this time to ensure that operation can only be controlled by the handheld terminal and cannot be operated from any other point on the equipment.

The hazard zone may only be entered by the person who is operating the handheld terminal. If it should be necessary for more than one person to work in the hazard zone at the same time, each person present requires an enabling device and machinery movement may only be allowed after all the enabling devices have been activated.

14.2.8 Information about the Emergency Stop Button

In theory, a perfectly designed machine should not require an emergency stop button, since the Machinery Directive demands that a machine must be safe throughout its lifetime and in all operating modes.

In practice, however, one is aware that unforeseen situations arise, in spite of all precautions. In order to enable fast shutdown of the machine in these cases, or to avert danger, an emergency stop button is provided on most machines.

As can be seen from the following illustration, a machine is permanently in the hazard state from the viewpoint of the emergency stop button, for as long as this is not activated.

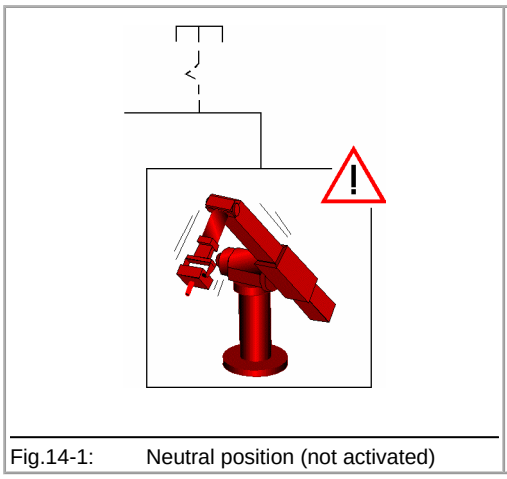


Fig.14-1: Neutral position (not activated)

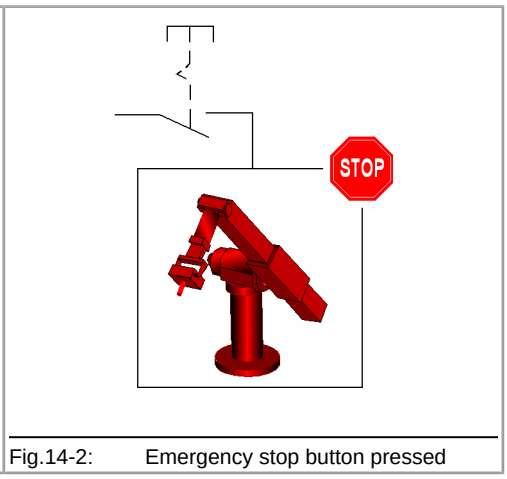


Fig.14-2: Emergency stop button pressed

Tab.14-3: Emergency stop button functions

© KEBA 2009

The emergency stop button may not, therefore, serve as the primary safety device but is provided exclusively to cover any residual risks.

Instead of this and depending on the mode of operation, other methods should be employed as the primary safety device, for example guards, light barriers and two-hand control devices or enabling switches.

When the emergency stop button is activated, the entire machine or all of the machines that are switched together in a plant must be lead to a safe state e.g. by stopping and switching off the power to the endangering drive mechanisms (stop categories 0 or 1 in accordance with EN 60204-1).

The release of the emergency stop button must not cause any uncontrolled restart of the machine.

Irrespective of whether a handheld terminal has an emergency stop button or not, permanently installed, universally identifiable and easily accessible emergency stop buttons must be provided at selected points around the machine in every case.

14.2.9 Application of Emergency Stop Button and Stop Button on the Handheld Terminal

The Machinery Directive does not specify any detailed requirements in respect to the colouring of the operating elements for emergency stop. The requirement states: “The device must have clearly identifiable, clearly visible and quickly accessible controls“.

Emergency stop buttons are usually identified by red/yellow. The specific design should have a signalling function whose effect is that any person, and especially untrained people, can quickly recognise the control as the device to eliminate a hazard in the case of an emergency.

One imperative requirement for equipment identified in this way is, therefore, that it must be possible to trigger a safe state at any time and in any operating mode, without further knowledge of the machine (see also EN ISO 13850).

It is not acceptable for an emergency stop button to be enabled temporarily, since this can lead to faulty operation and life threatening loss of time in panic situations.

If one considers handheld terminals in relation to these requirements it is evident that a differentiation must be made as to whether an emergency stop button on the handheld terminal may be used or not, depending on specific criteria and applications.

14.2.9.1 Permanently installed handheld terminals: Emergency stop button

Permanently installed handheld terminals are provided with a cable by means of which the handheld terminal is connected to the designated machine. The handheld terminal is usually connected to or disconnected from the machine with the machine switched off. This takes place during the installation or de-installation process. The handheld terminal’s are not designed to be connected or disconnected whilst the machine is operating.

KEBA © KEBA 2009

On many simple machines the handheld terminal is also the only operating option, so that, without the handheld terminal, the machine cannot be put into operation at all. Nonetheless, if the connector is unplugged from the machine during operation the emergency stop circuit is broken and the emergency stop function of the machine is activated, causing the machine to stop.

If a handheld terminal is uninstalled from a machine and is not reinstalled immediately, the equipment must be locked out in order to avoid confusion with a functioning handheld terminal. The machine can only be put back into operation again after a new handheld terminal has been installed.

This procedure must be described in the operating instructions for the machine and is the responsibility of the operator.

Due to the fact that plugging and unplugging takes place only rarely and that the machine is out of operation when unplugged, the risk of an accident as the result of a non-operational emergency stop button is considered to be very low and the use of red/yellow identification is therefore permissible.

The red/yellow emergency stop button must be connected into the emergency stop circuit of the machine in any case and must cause the power supply to the machine or set of machines in a plant to be switched off (stop category 0 or 1 in accordance with EN 60204-1).

14.2.9.2 Radio controlled handheld terminals: Stop button

Wireless handheld terminal’s present a different case. These devices are not normally assigned to a specific machine but can be frequently logged on and off whilst the machine is in operation and can also be switched between different machines. For this reason the stop button is not always operational and the operating status is not clear to everyone.

Therefore, for stop functions in wireless controllers, EN 60204-1:2006 "Safety of Machinery. Electrical Equipment of Machines" (Chapter 9.2.7.3), demands:

"The operating means to initiate this stop function shall not be marked or labelled as an emergency stop device, even though the stop function initiated on the machine can be an emergency stop function."

For this reason, for radio controlled handheld terminal’s KEBA uses a stop button that features all the mechanical characteristics of a normal emergency stop button but is of a neutral grey colour.

In contrast to the red/yellow emergency stop button there is no need to switch the stop output signals of the radio receiver into the machine’s normal emergency stop circuit. It can also be used to stop individual safety zones of a machine or plant, where functions such as “Safe operational stop” can be triggered. This means that the drive components are safely maintained in controlled shutdown by means of active, powered drives (stop category 2 in accordance with EN 60204-1). This can prevent the loss of reference data and facilitates fast restart of the machines.

The trained handheld terminal or machine operator is aware of the function assigned to the button and knows the current operating mode in each case as well as the current assignment of the machine. For this reason the colouring is not disadvantageous to the machine operator.

© KEBA 2009

The safety gain is that, in the case of inactive or unassigned equipment, no danger of confusion is presented to third parties in respect of functional emergency stop buttons.

14.2.9.3 Temporary plug-in handheld terminals: Stop button

Some cabled equipment is provided with a quick-release connector (e.g. bayonet) that makes it possible to plug in and unplug the handheld terminal quickly and ergonomically whilst the machine is in operation. Such handheld terminal's are provided for frequent alternation of operation between one or more machines and are needed there on a temporary basis, for commissioning or setting up purposes.

By means of several measures, such as bridging connectors or relay circuits, the emergency stop circuits of the machine are bridged when the handheld terminal is unplugged so that the machine can also continue to run in normal operation without the handheld terminal. Start-up and operation of the machine can then take place using an independent operating device.

These handheld terminals share the same problems as the radio terminals, since due to frequent plugging and unplugging it cannot be ruled out that disconnected handheld terminal's with ineffective stop buttons may be left lying or hanging temporarily in a machine shop or factory in the neighbourhood of working machines and may be mistaken for functional units in an emergency situation.

This special case is not clearly treated in the corresponding Standards. However, in the Product Standards for presses (EN 692:2004, EN 693:2001, EN 12622:2001, EN 13736:2003) one finds the following clear statement:

"Any disconnectable control station shall not incorporate an emergency stop button if the press can be operated while this controls station is disconnected."

Further Product Standards are currently under review.

In several discussions with external notified bodies and technical committees it was also determined that temporary, plug-in handheld terminals should be treated as radio handheld terminal's.

The approach to constructively eliminate hazards by using clear colour coding, in preference to any organisational measures, also corresponds to the "Principles for the Integration of Safety" of the Machinery Directive and is therefore legally binding.

For this reason, temporary plug-in handheld terminals may likewise only be equipped with a grey stop button.

Since handheld terminals made by several other manufacturers are on the market with a grey stop button and have been certified by nominated test centres, the state of the art requirement is also met.

14.2.10 Information about Enabling Devices

Many machines have both a normal and special operating modes.

KEBA © KEBA 2009

The machine fulfils its primary mission in normal (automatic) operation. In this mode of operation, safety is guaranteed by closed, guards and/or with protective devices.

A machine's special operating modes serve to maintain normal operation. In doing so, safety must be guaranteed in a way that is different to normal operation, since hazardous areas of the machine can now be entered and targeted machine movements have to be possible. The enabling device plays a primary role here.

This application requires the enabling device to eliminate the hazards that are to be controlled in a timely manner, before any personal injury occurs. Additional safety measures may be necessary for this purpose, such as safely reducing the speed of drive mechanisms.

In contrast to the emergency stop button respectively the stop button, a machine in special operating mode with an enabling button is in a safe state as long as this enabling button is not activated (see illustration).

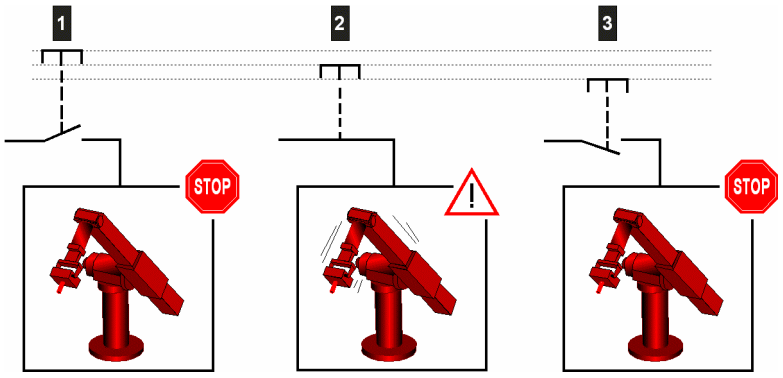


Fig.14-4: Enabling functions

1 ... "Neutral position" not activated	2 ... "Enabling" pressed
3 ... "Panic" pressed heavily	

The enabling function is also described in EN 60204-1:2006 and corresponds to the state of the art.

The panic position on 3 stage enabling switches was introduced because limbs often become cramped when a person is in a state of shock and as a result is not able to release the enabling switch. For this reason, firmly pushing down on the enabling switch also leads to switch off.

The controller must be designed in such a way that machine movement is not initiated directly when the enabling device is activated but only as a result of the additional activation of a control button. This may be via the handheld terminal's membrane keyboard or graphical software buttons on the touch screen.

An optionally available joystick can also be used to trigger the machine movement signal.

© KEBA 2009

According to EN 60204, only stop categories 0 or 1 are allowed for the enabling function, i.e. stopping the machine with the enabling device must always be combined with switching off the power supply to the drive mechanisms.

In order to prevent incorrect, permanent activation of the enabling switch by mechanical fixing devices, it is recommended to limit the maximum duration of an accepted enablement. This must be achieved by means of a controller located downstream to the handheld terminal.

An enabling device is not a replacement for a two-hand control device, which is specified for some machines (e.g. presses) and must therefore not be confused.

In contrast to the enabling device, the two-hand control device forces the endangered limbs of the operator into a safe position whilst the machine is in motion.

14.3 Electromagnetic Compatibility

The European Union obligates its member states to harmonise their statutory provisions in respect of electromagnetic compatibility by means of Directive 2004/108/EC. In the following text this Directive is abbreviated to the EMC Directive.

All electrical and electronic device that is put into circulation in Europe must, therefore, conform to the fundamental safety requirements of the EMC Directive. According to this Directive, electromagnetic compatibility is the ability of a device, plant or system to work satisfactorily in the electromagnetic environment, without itself causing electromagnetic interference that would be unacceptable to all devices, plant and systems present in this environment.

In addition to the legal requirements described above, the reliable functioning of an electrical device is also a fundamental quality characteristic of such a device.

As well as basic information concerning electromagnetic compatibility, the following pages describe the implementation of the EMC requirements in respect of the KeTop product range of handheld terminal devices.

14.3.1 The electromagnetic environment – interference sources, interference sinks and coupling paths

There are a number of artificial and also natural sources of interference in the electromagnetic environment that can affect electrical and electronic device.

The most well-known natural interference phenomenon is atmospheric discharge (lightning discharge).

Artificial sources of interference are, on the one hand, intentional, such as mobile radio, amateur radio, TV and radio transmitters, and, on the other hand, unintentional, such as microwave ovens, arc welding, ignition systems, high voltage device, electric motors, electronic device and also electrostatic discharge.

KEBA © KEBA 2009

14.3.1.1 Atmospheric discharge (lightning)

Atmospheric discharge can take place directly or indirectly on power and communication lines. The consequence of such an impact if there is insufficient protection is the destruction of the electrical device.

Atmospheric discharge is simulated in accordance with the international test standard IEC 61000-4-5 (EN 61000-4-5 for Europe) – "Electromagnetic compatibility (EMC). Testing and measurement techniques. Surge immunity test".

The relevant international product standard for control systems, IEC61131-2 (EN61131-2 for Europe), divides the areas of application into zones. Higher or lower levels of interference can be expected depending on the zone in question. All Kemro-K2 control systems and also the products of the KeTop range are suitable for application in Zone B.

The product standard requires the testing of surge immunity in accordance with IEC 61000-4-5.

14.3.1.2 Electrostatic discharge (ESD)

Materials can be charged by contact followed by subsequent separation. This effect only arises when at least one of the two materials is a non-conductor. As a result, discharge may take place if a charged conductor, or one that is changed by the influence of an electronic field, comes near a metallic object.

After charging, the possible voltages between the charged bodies can reach over 10 kV.

The most frequent occurrence of electrostatic discharge takes place between people and metallic objects. Since one is practically unnoticed of discharges below 3500 V and yet electronic components are destroyed by low voltages, ESD damage to electronic components often goes unnoticed.

The international Standard IEC 61000-4-2 (EN 61000-4-2 for Europe) is used to simulate the measurement of electrostatic discharge. The international product standard IEC 61131-2 (EN 61131-2 in Europe) for programmable controls demands testing to IEC 61000-4-2 and also defines the severity level.

14.3.1.3 Technical systems as interference sources

Technical systems can act as sources of interference. In doing so, the interference may be intentional or unintentional. Electromechanical energy is often also used for material processing.

Periodically occurring interference:

- Ignition impulses of combustion engines
- Sparking of commutator motors
- Electromagnetic fields of induction furnaces, arc welding device, microwave device etc.
- Pulse currents from frequency converters and switching power supplies
- Electromagnetic fields of radio and telecommunications device

Randomly occurring interference:

© KEBA 2009

- Ignition impulses of fluorescent lamps
- Switching procedures on inductive electrical circuits
- Contact bounces when closing or opening make-and-break contacts
- Voltage fluctuations on heavy load switching procedures

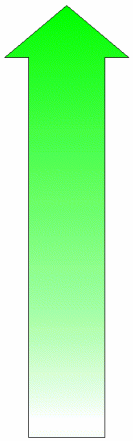
There is a series of test standards for the above listed sources of interference, intentionally or unintentionally caused by technical systems, which simulate this interference:

- IEC 61000-4-3 High Frequency Electromagnetic Field Immunity Test
- IEC 61000-4-4 Electrical Fast Transient / Burst Immunity Test
- IEC 61000-4-6 Test of Immunity to Conducted Disturbances, Induced by High Frequency Fields
- IEC 61000-4-8 Power Frequency Magnetic Field Immunity Test
- IEC 61000-4-11 Voltage Dips, Short Interruptions and Voltage Variations Immunity Test

All the international Standards listed here are also available as European Standards. The Product Standard IEC 61131-2 demands testing to these Standards and also defines the severity level.

14.3.1.4 Technical systems as interference sinks

In the case of functional interference, EMC problems first arise at interference sinks. The following interference sinks can be identified dependent on the degree of immunity to electromagnetic influences:

Immunity		Interference sinks
max		Transformers
		Circuit breakers, contactors
		Relays
		Power transistors
min		Transistor circuits
		Integrated switching circuits

Tab.14-5: Examples for technical systems as interference sinks

Control systems without integrated switching circuits are unthinkable and would therefore not be sufficiently immune without suitable EMC measures.

KEBA © KEBA 2009

14.3.1.5 Coupling paths

The transfer of interference signals from an interference source to an interference sink can take place via various coupling paths.

Coupling paths very often consist of two or more parallel lines running closely together. The coupling is a field coupling that takes place at low frequencies either via the electrical field (capacitive coupling) or via the magnetic field (inductive coupling).

At high frequencies and with corresponding expansion of the parallel running lines one speaks about an electromagnetic coupling due to close linking of both field types.

Direct coupling can occur when electrical circuits from the interference source and electrical circuits from the interference sink have common line components.

If there is a large distance between an interference source and an interference sink then one speaks of a radiation coupling.

14.3.2 EMC measures

In principle, all devices should be designed in such a way as to function reliably in the planned environment and in doing so should not interfere with other systems. All products of the Kemro product range (K2 control systems and KeTop) meet these requirements and it is not necessary to use any of the EMC measures described below when the specified additional units, cables and wiring are used.

However, additional EMC measures may be necessary for various reasons.

The following text is designed to help the user to correctly implement any additional EMC measures.

14.3.2.1 Shielding

Electromagnetic emission problems and immunity problems often occur in products at the same time. Likewise, EMC measures are mostly effective in the case of both emission problems and immunity problems.

Shielding fulfils two main tasks. On the one hand, the penetration of electromagnetic fields into sensitive electronic parts is prevented and, on the other hand, the radiation of electromagnetic fields is also prevented.

A complete EMC shield consists of a shielded housing, which protects the sensitive electronics and prevents them from transmitting interference, and cable shields that shield the sensitive interface signals and prevent the device from transmitting interference via its interfaces.

The cable shield basically connects two shielded housings together and must therefore be connected directly to the shielded housings of the sensitive electronics (connection points).

Particular attention should be paid to the connection between the cable shield and the shielded housings of the device. In order that the shield effect is maintained even at higher frequencies, care must be taken to ensure that the cable shield connects to the largest possible surface area and thereby acts as a

© KEBA 2009

continuation of the device's shielded housing. Pig tail connections are not suitable.

It may be necessary to earth cable shields and shielded housings for safety reasons but this is not an effective EMC measure.

14.3.2.2 Interference suppressors, filter components

Filtering is always necessary when unshielded signal and power supply lines are brought into shielded areas. Alongside the wanted signals, these lines often also carry interference signals that must not enter into shielded areas. Filters should therefore guarantee the interference immunity of the device but should also prevent the emission of interference from the device via unshielded lines.

Unshielded lines are usually used when the wanted signals that are carried are of a very low frequency. The normally high frequency interference signals are separated from the wanted signals by means of frequency selective filtering with the aid of low-pass filtering.

Low-pass filters must be sized in such a way that the lower frequency wanted signals can pass through and the higher frequency interference signals are filtered.

Multi-stage filters are often necessary for filtering. Nearly all filter combinations contain Y-capacitors, i.e. capacitors that are connected to the filter housing for the dissipation of interference currents. In order for these filters to function correctly, the housing must be connected to a stable reference potential.

Since the interference signals must not enter into the shielded area, the potential of the shielded housing must also be the reference potential for the filter circuits.

Filter circuits or filter components must therefore be placed precisely where the lines enter the shielded area. If the filters are placed inside or outside the shield wall, this can lead to a field coupling between the filtered and unfiltered lines.

The connection to the reference potential must be as low impedance as possible and therefore it is necessary for there to be contact over a large surface area between the filter housing, which is usually metallic, and the shield wall of the device. Pig tails may not be used to make such a contact.

Line filters

Typical line filters have a metal housing that has to be connected to the earth wire (PE) for safety reasons and consist of a current-compensated choke (see illustration) consisting of Y-capacitors, which are connected to the metal housing on one side, and X-capacitors (connected between the phases or between phase and neutral).

KEBA © KEBA 2009

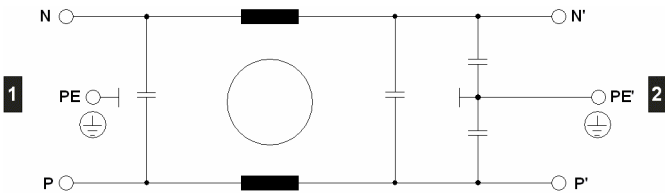


Fig.14-6: Line filter

The desired filter effect is basically governed by the correct contact between the filter housing and the shielded housing of the device. The line filters must therefore be placed directly at the inlet to the shielded housing of the device and a very good connection must be made between the metal housing of the filter and the shielded housing of the device.

If placement at the inlet is not possible for reasons of space, partly shielded connection lines must be used. In doing so the following procedure is to be followed:

If the filter is placed inside the shielded housing of the device, the line cable must be shielded from the inlet through to the line filter and the cable shield contacted on both ends. This prevents the propagation of interference on the line cable inside the device. It also prevents any electromagnetic fields that may be present inside the device from penetrating the line cable.

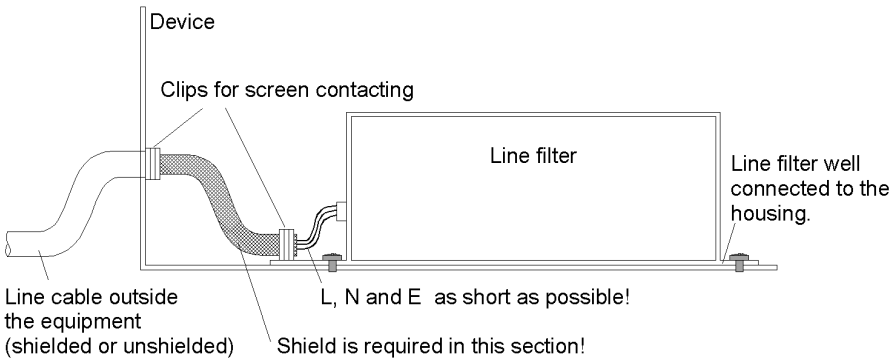

Device
Clips for screen contacting
Line filter
Line filter well connected to the housing.
Line cable outside the equipment (shielded or unshielded)
L, N and E as short as possible!
Shield is required in this section!

Fig.14-7: Correct connection of a compact line filter

If the line filter is placed outside the shielded housing, the device connection line must be shielded from the line filter through to the shielded housing of the device and the cable shield must be contacted on both ends. This prevents interference produced by the device from being transmitted externally where it could penetrate other systems. It also prevents the penetration of interference signals back into connection wires that have already been filtered.

© KEBA 2009

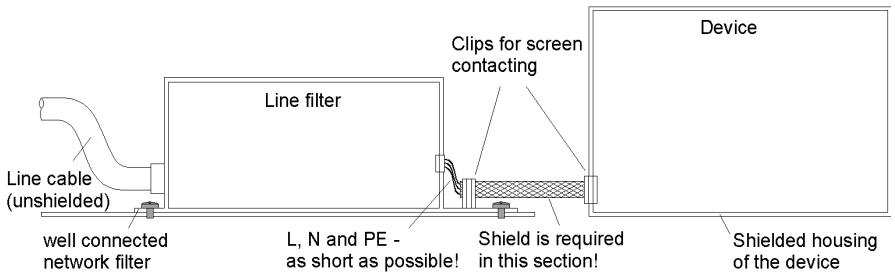

Device
Clips for screen contacting
Line filter
Line cable (unshielded)
well connected network filter
L, N and PE - as short as possible!
Shield is required in this section!
Shielded housing of the device

Fig.14-8: Correct connection of a compact line filter

When connecting line filters, attention should first be paid to the frequency ranges to be filtered. If frequencies in the MHz range are also to be filtered, such a line filter should have a metal housing. Line filters with plastic housings are normally not suitable for this purpose.

Current-compensating chokes

Device manufacturers sometimes specify the use of current-compensating chokes or the installation of ferrite loops in the power supply line. Many examples of this can be found in motor lines that are fed by frequency inverters.

Such chokes (see the following illustrations) suppress common-mode interference currents (I_S) and allow the operating currents (I_B) to pass unhindered. It should be noted that the operating currents in the core produce self-cancelling magnetic fields so that the operating current does not saturate the ferrite cores. Such throttles must also be placed at the inlet to the shielded housing of the device.

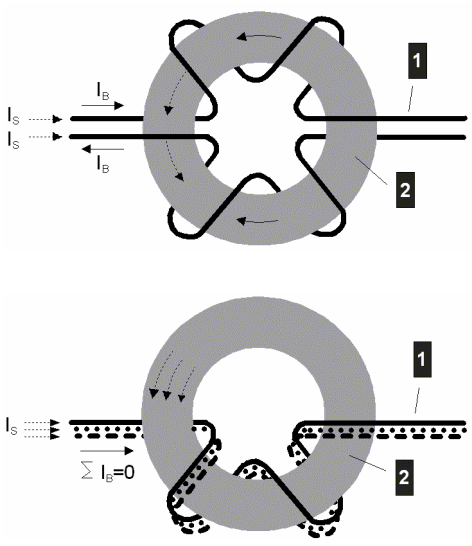


Fig.14-9: Current flow of a current-compensating choke

I_S ... Interference current	I_B ... Operating current
1 ... Power supply lines	2 ... Ferrite hoop

KEBA © KEBA 2009

14.3.2.3 Ferrites

Ferrites operating via data lines work in a similar way to current-compensating chokes. The wanted signals (see illustration) can pass unhindered and the interference signals are damped. A fundamental difference from current-compensating chokes is that in the case of ferrites the application range takes place at higher frequencies and therefore the material losses are responsible for the damping and the interference is not reflected, as in the case of inductance, but is converted into heat.

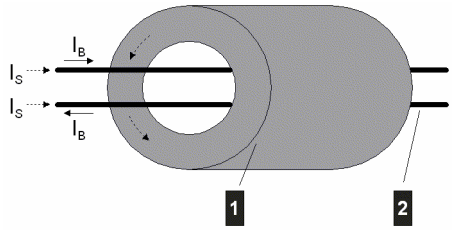


Fig.14-10: Current flow for ferrites

I_S ... Interference current	I_B ... Operating current
1 ... Ferrite	2 ... Data lines

14.3.2.4 Prevention of couplings

Coupling between interference sensitive signals (e.g. analogue signals) and the lines that carry the interference signals (e.g. motor lines) can be reduced by laying cables separately.

14.3.3 EMC measures on KeTop

The KeTop is designed for industrial applications. Considerable electromagnetic and electrostatic interference can occur in this environment. For this reason special emphasis was placed on interference immunity and data security in the design of the device. The EMC design implemented and described below considers all the above named sources of interference and the possible coupling paths.

- All shielding and filter measures (filtered power supply) in the KeTop are carried out directly on the printed circuit board.
- The special design of the KeTop cable guarantees interference immunity even for greater connection lengths, i.e. the data lines (communication signals) are shielded and so they are separated from the control lines (power supply, enabling button, emergency off, key-operated switch etc.) inside the KeTop cable.
- Power supply lines in the control cabinet are usually unshielded. They are therefore laid outside the KeTop cable shield in order to prevent a coupling with the sensitive data lines.
- The unshielded control and power supply lines are either filtered on entry into the shielded housing of the KeTop or separated from the electronics in such a way that any interference signals carried by these lines cannot affect the internal electronics of the KeTop.

© KEBA 2009

- It is not necessary to lay the KeTop cable separately.

14.3.3.1 Shield connections

The cable shield of the KeTop cable can be considered to be an extension of the KeTop shielded housing (=printed circuit board) to the shielded housing of the communication partner (e.g.: PLC). From this it can be deduced that the shielded connections from the cable shield to the device shields make a fundamental contribution to the interference immunity of the KeTop. It is not necessary to wire shielded connections to earth.

The shielding connection in the KeTop is made via the RJ-45 connector in the connection slot.

Connecting the KeTop via the connection box (e.g. CB211) guarantees safe shielding protection right through to the communication partner. It is therefore urgently recommended to use a suitable KEBA connection box.

All connection cables available from KEBA (KeTop TTxxx, KeTop ICxxx, KeTop XD040 and KeTop CD040) guarantee correct shielding connection.

For self-made cables the following conditions must be met for shielding data lines:

- On every connector design (DSUB or RJ-45) the cable shield must be connected to as large a surface area of the connector housing as possible.

Fig.14-11: Correct shield connection for DSUB and RJ-45 connectors

1 ... Metallised or metallic housing
2 ... Connect the shield to a large surface area

- The use of pig tails for contacting the cable shield via plug pins is unsuitable. The inductivity of such pig tails represents high impedance resistance for higher frequency interference; this means an apparent break in the cable shield. Interference is then no longer diverted and works directly on the inner lines.

KEBA © KEBA 2009

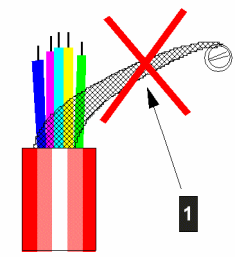


Fig.14-12: Insufficient contacting of a cable shield

1 ... No pig tails

14.3.3.2 Shielding inside the control cabinet

In many cases a range of interference sources, such as servo drive modules, transformers, contactors and relays, is present in the control cabinet. It is therefore necessary to run the cable shield from the connector housing (control cabinet) to the control (continuous connection from the handheld terminal to the control).

When using the appropriate connection box and a shielded cable for the data line from the connection box to the control, the continuous, high frequency compatible connection of the shield from the KeTop to the control is guaranteed.

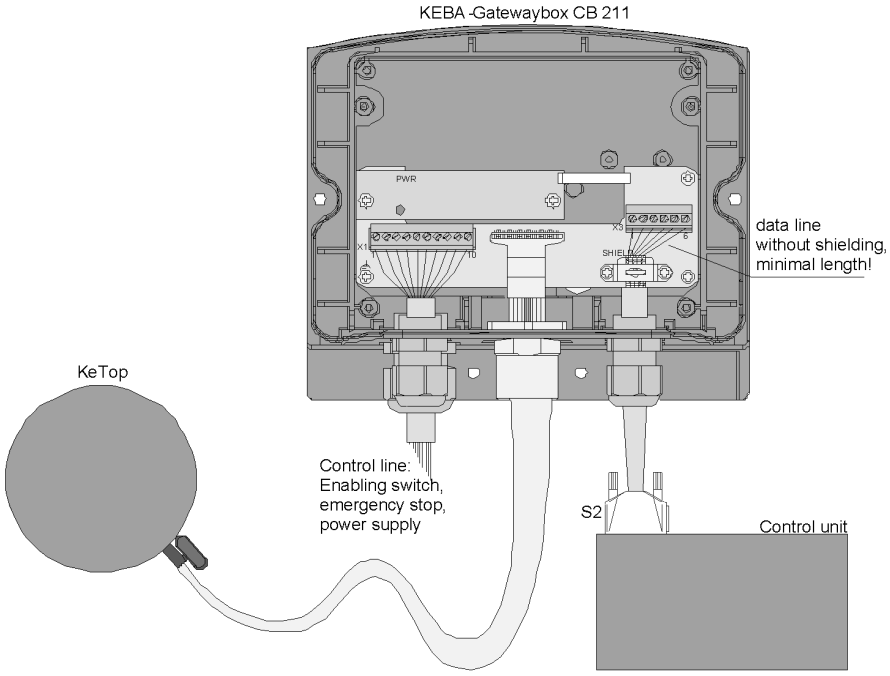
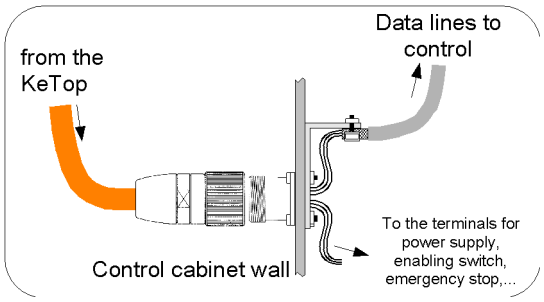


Fig.14-13: Example of a correct shield connection in a KEBA connection box

If for some reason a connection box cannot be used, the continuous connection of the shielding on less critical interface types such as RS-232-C takes place by contacting the connector housing with the control cabinet and inside the control cabinet by contacting the shielding with the control cabinet (using

© KEBA 2009

shielding clips). The smaller the distance between the contacting of the connector housing on the control cabinet to the cable clip in the control cabinet, the better the shield damping.


Data lines to control
from the KeTop
To the terminals for power supply, enabling switch, emergency stop,...
Control cabinet wall

The interference immunity of the device with the connection type presented above is also decisively influenced by the satisfactory separation of the control signals and the data line signals. The better the separation of the two signal types and the shorter the shielding connection, the higher will be the interference immunity of the complete system.

If the Ethernet is used as the communications interface (KeTop T100 only) one of the two connection cables provided for the purpose of connecting to a control system must be used (IC020 or IC040). Both cables carry the Ethernet signals to a suitable connector (RJ-45) and thereby produce a continuous shielding connection and also the required characteristic impedance of the cable.

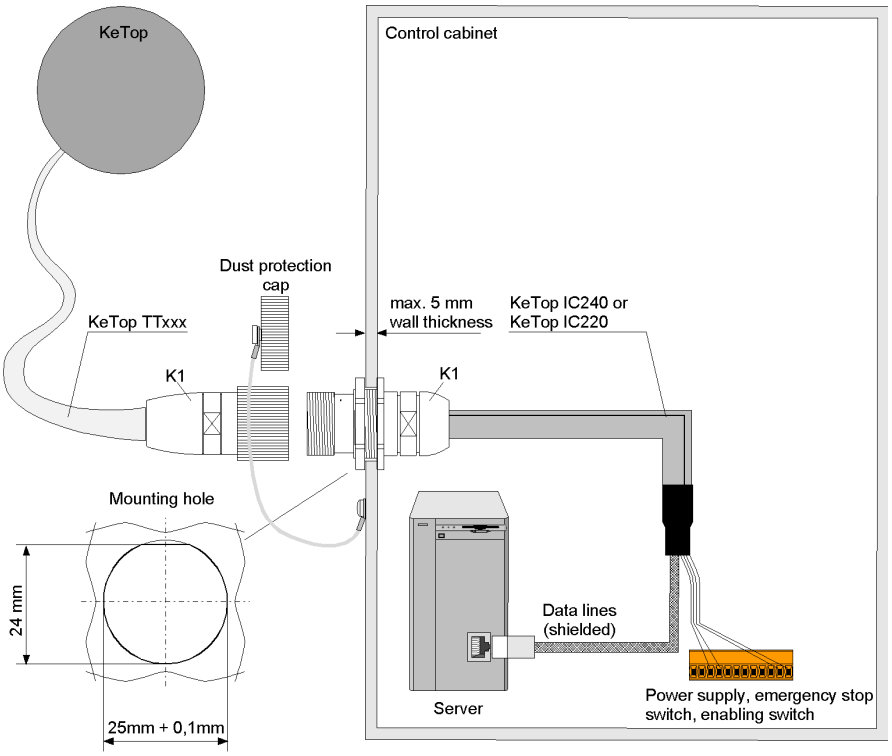


Fig.14-14: Connection cable IC020 or IC040 in the control cabinet

KEBA © KEBA 2009

14.4 List of the appropriate EC directives and applied standards

14.4.1 EC directives

98/37/EC and 2006/42/EC (valid from 2009-12-29)	Directive for the safety of machinery with the application 98/79/EC and MD 2006/42/EC
2004/108/EC	EMC directive

14.4.2 Standards

For examination of the conformity of the KeTop regarding the directives the following legally not bounded european standards has been used:

14.4.2.1 Examination of the conformity regarding the directive of machinery

EN ISO 13850:2006	Safety of machinery - emergency stop equipment, functional aspects, principles for design
EN ISO 13849-1:2008	Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design
EN 60204-1:2006, chap. 9, 10	Safety of machinery - Electrical equipment of machines, general requirements

14.4.2.2 Examination of the conformity regarding the directive of EMC

EN 61131-2:2003 chap. 8, 9	Programmable Controllers, Part 2: Equipment requirements and test

So the accordance to following standards is also given:

EN 61000-6-2:2001	Electromagnetic compatibility (EMC): Generic standards - Emission standard for industrial environments
EN 61000-6-4:2001	Electromagnetic compatibility (EMC): Generic standards - Immunity for industrial environments

14.4.2.3 Other standards

For the design of the safety concept some parts of the following legally not bounded european standards has been used.

General procedure and safety principles

EN ISO 12100-1:2003	Safety of machinery - Basic concepts, general priciples for design - Part 1: Basic terminology, methodology
EN ISO 12100-2:2003	Safety of machinery - Basic concepts, general principles for design - Part 2: Technical principles

Enabling switch

EN ISO 13849-1:2008	Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design
EN 60204-1:2006	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
ISO 10218-1:2006	Manipulating Industrial Robots - Safety

© KEBA 2009

Stop switch and ermergency stop switch

EN ISO 13850:2006	Safety of machinery; emergency stop equipment, functional aspects; principles for design
EN 60204-1:2006 chap. 9, 10	Safety of machinery - Electrical equipment of machines - Part 1: General requirements

Ergonomics

EN 614-1:2006	Safety of machinery - Ergonomic design principles - Part 1: Terminology and general principles
EN 894-1:1997	Safety of machinery - Ergonomics requirements for the design of displays and control actuators - Part 1: General principles for human interactions with displays
EN 894-2:1997	Safety of machinery - Ergonomics requirements for the design of displays and control actuators - Part 2: Displays
EN 894-3:2000	Safety of machinery - Ergonomics requirements for the design of displays and control actuators - Part 3: Control actuators

Stability and impermeability of casing

EN 60529:1991	Protection degree of casing
EN 61131-2:2003 chap. 12	Programmable controllers - Part 2: Equipment requirements and tests

Electrical safeness and fire protection

EN 61131-2:2003 chap. 11	Programmable controllers - Part 2: Equipment requirements and tests
EN 50178:1997	Electronic equipment for use in power installations

Environmental Conditions

EN 61131-2:2003 chap. 4	Programmable controllers - Part 2: Equipment requirements and tests
EN 50178	Electronic equipment for use in power installations

For the US market these standards had been used furthermore:

UL examination for industrial control equipment

UL 508, 17th edition (=CSA C22.2 No.14)	Industrial Control Equipment (NRAQ, NRAQ7)

UL examination for robotic applications

UL 1740, 1998	Industrial Robots and Robotic Equipment E216950 (TETZ2, TETZ8)

KEBA © KEBA 2009

15 Conformity and Type Examination

15.1 EC Conformity Declaration

KEBA

EC Declaration of Conformity

CE

KEBA AG
Gewerbepark Urfahr
4041 Linz
AUSTRIA

Document No.: **55491/CE/1**

We declare that the following products

Name of product: **KeTop T100**
KeTop C100

Variants: **all variants**

are in conformity with the essential requirements of the following European Council Directives:

- **EC-Directive relating to machinery 2006/42/EC**
- **EC-Directive relating to electromagnetic compatibility 2004/108/EC**

Conformity to the directive 2006/42/EC is assured by the compliance with the applicable parts of the following harmonized european standards for the emergency stop switch respectively stopp switch (if available) as well as the enabling device:

- **EN ISO 13849-1:2008**
- **EN ISO 13850:2006**
- **EN 60204-1:2006**

A type certificate was issued by the certification body NSBIV AG SIBE Switzerland, Inseliquai 8, 6005 Luzern, Switzerland. Type-Examination Certificate No. 1031/2.

Conformity to the directive 2004/108/EC is assured by the compliance with the applicable parts of the following harmonized european standard:

- **EN 61131-2:2003**

Important notes:

The emergency stop switch respectively stop switch (if available) and enabling switches are part of the safety control circuits of a machine. Therefore the fundamental safety requirements in accordance with Appendix 1 of the Directive for machines can only be met with all safety control circuits.

Any modification on the product(s), that is performed without KEBA's consent will render this declaration invalid.

This declaration certifies the conformity with the directives mentioned, but does not imply any warranty of the features of the product(s).

The safety instructions contained in the documentation supplied with the product(s) must implicitly be followed!

Authorised person to compile the technical file is Wolfgang Mahr, Keba AG, Gwerbepark Urfahr, A-4041 Linz.

Linz, 29.9.2009

Dipl.-Ing. Gerhard Ensinger
Head of Development Center

ketop_T100_engl1.doc

© KEBA 2009

15.2 EC Type-Examination Certificate

S CE S SCHWEIZERISCHER ZERTIFIZIERUNGSDIENST
SERVICE SUISSE DE CERTIFICATION
SERVIZIO SVIZZERO DI CERTIFICAZIONE
SWISS CERTIFICATION SERVICE

SCESp 046

Certifying Body
SIBE Schweiz

Accredited Certification Body SIBE Schweiz in accordance with EN 45011
Designated European Conformity Assessment Body (Notified Body), EC-Identification No: 1247

Type-Examination Certificate No. 1031 / 2

Product	Command device Hand Held Terminal with 3-position enabling switch
Brand	KEBA
Type	KETOP T100 / KETOP C100
Safety specifications	EN ISO 13849-1:2008 Categorie 3 PL d The safety functions of this special operating mode control are only been given, if the remarks in the user manual are followed. The 3-position enabling switch and the stop button meets the request according to EN 60204-1.
Manufacturer's address	Keba AG Gewerbepark Urfahr A-4041 Linz
Applicant's address	Keba AG Gewerbepark Urfahr A-4041 Linz
Valid until	29 December 2014

The examined type complies with the relevant provisions of the Directive 2006/42/EC of 17 may 2006 on machinery.

The validity of this certificate is based as well on all attachments named herein and the general provisions outlined on the reverse side.

Date of issue
29 September 2009

Valid from
29 December 2009

Certification Body
NSBIV AG
Certification Body SIBE Schweiz
P.O. Box 3518
CH-6002 Lucerne, Switzerland

Safety Engineer
M. Luzzatto

Head of Certification Body
P. Keller

© KEBA 2009